CAIS STANDARD MANUAL

SYSTEM NO. 18
AIRFIELDS

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MEMORANDUM FOR DTIC-OCP
ATTN: Ms. Lue Lynch
8725 John J. Kingman Road, Suite 0944
Fort Belvoir, VA 22060-6218

FROM: AL/EQ (STINFO)
139 Barnes Drive. Suite 2
Tyndall AFB FL 32403-5323

SUBJECT: Transmision of Technical Documents

1. As per telephone conversation with Andrew Poulis, EQ/TIC, the attached CAIS CTDS manuals are forwarded for accession, cataloging, and microconversions. Please forward the accession numbers to:

Andrew Poulis
AL/EQ/TIC
139 Barnes Drive. Suite 2
Tyndall AFB, FL 32403-5323

2. The Distribution statement should read as follows: Approved for Public Release: Distribution Unlimited.

3. If you have questions about these documents, please contact Andrew Poulis at DSN 523-6285.

Larry L. Testerman

LARRY L. TESTERMAN
Scientific and Technical
Information Program Manager

Atchs: Manuals

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ABSTRACT

GENERAL ORGANIZATION

At this installation the list of facilities to be surveyed, including infrastructure, will be addressed on the basis of 32 unique systems that form the CAIS Engineering Deficiency Standards and Inspection Methods document. Each system deals with a specific technical aspect of the facility to be surveyed. Within each system a further breakdown is made to subsystems, each having a related list of components. Detailed observations of the listed defects are provided so as to allow the entry of observed quantification data. A DOD CAIS manual is provided for each of the 32 systems with an internal organization as outlined below:

INSPECTOR'S GUIDE

I. General
   A. Level I Inspection Method Description
   B. Level II Inspection Method Description
   C. Level III Inspection Method Description

II. General Inspection
   A. Process. This section describes the process of the inspection activity.
   B. Location. This section describes the procedure for locating the inspection units in the facility or infrastructure on this installation.

III. Inspector Qualifications
   This section notes the minimum qualifications for the person or persons performing the survey.

IV. Inspection Unit
   This section describes how the IU (Inspection Unit) is determined for the particular component being surveyed.

V. Unit Costs
   This section notes the nature of repair costs for this system.

VI. Standard Safety Requirements
   This section lists safety procedures and equipment required to implement a safe environment for the conduct of this survey.

VII. Standard Tools
   This section lists a set of standard tools required for the general conduct of this survey.

VIII. Special Tools and Equipment Requirements
   This section refers to special tools or equipment requirements endemic to the nature of the system being surveyed.

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IX. Level II Inspection Method Keys
This section explains and locates Level II Key sheets.

X. Level III Inspection Method Keys
This section explains and locates Level III Key sheets.

XI. Replacement Cost
This section describes the nature and location of replacement cost data.

XII. Appendices
Appendix A. Provides a summary and definition of all abbreviations used both in the Standards and in the data base.

Appendix B. Provides a glossary of terms with their definitions as used in the Standard.

Appendix C. This section contains a listing of the average life cycle durations for each assembly* in the Standard.

* Assembly is a term describing the level at which replacement rather than repair occurs. This can be at the subsystem or component designation, depending on the system being surveyed.

SYSTEM TREE

The System Tree is a graphical representation of the Work Breakdown Structure, showing system, subsystem and component relationships for the Airfields System.

INSPECTION METHODS

Description
Describes the nature of what is to be condition surveyed.

Special Tool and Equipment Requirements
Lists any special tools required for this specific subsystem.

Special Safety Requirements
This section outlines any special safety measures or equipment required for this specific subsystem so as to maintain a safe environment and process in the conduct of the condition survey.

Component List
All components to be surveyed under this subsystem are listed here.

Related Subsystems
All other subsystems that have a survey relationship to this subsystem are listed here to help coordinate a complete and thorough condition assessment survey.

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Standard Inspection Procedure

This statement indicates the various levels of survey effort required for this subsystem.

Components

The previously listed components of this subsystem are described with a survey procedure recommended on a component by component basis. For each component there is a listing of defects with each defect broken down into observations describing the nature and severity of the defective condition observed. The surveyor enters a quantification value for each defect/observation encountered in the field CAIS device (DCD) to record the result of his survey.

References

This page lists the reference sources from which the foregoing subsystem data was developed.

Guide Sheet Control Number

This section lists the key numbers that tie the written Level II and Level III guide sheets to specific components in this subsystem.

Level II and Level III Inspection Method Guide Sheets

This section contains the detailed descriptions of the Level II and III survey and inspection procedures for this subsystem.

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INSPECTOR'S GUIDE

I. GENERAL

A. Level I Inspection Method

The Level I Inspection Method for Airfields consists of a thorough inspection of pavements, surfaces, lighting, lighting vault and specialty systems as described in the work breakdown structure. The Level I inspection is either a walk-by inspection with measurements or a drive-by inspection using a standard vehicle. The inspection is designed to be performed by one person. Although airfield systems may consist of several components, only components visual from the surface can be inspected as part of the Level I inspection.

B. Level II Inspection Method

Airfield employs very few Level II inspection methods since most defect/observations are readily apparent from visual inspection. Some Components may require a Level II inspection to ascertain whether visually identifiable defects impede the operation of the component. However, for most airfield assets, the Level II inspection is not required because this inspection is essentially a much more detailed inspection, and reinspection of the Level I inspection.

C. Level III Inspection Method

Analyses of the Level I data may indicate that the component requires further investigation and testing to formulate a rehabilitation/repair strategy. In such cases, the identified Components will be evaluated more in detail using the Level III inspection techniques. For many Components, the Level III inspection involves a more extensive testing consisting of Non-Destructive Testing (NDT) to measure certain performance characteristics, and partially destructive testing to determine certain physical and engineering properties of component materials.

II. GENERAL INSPECTION

A. Process

The inspection is normally conducted at the component level. Figure 18-A provides the breakdown from system through component for Airfields.

The inspector will work through the Work Breakdown Structure (WBS) to conduct the inspection. At the component level the inspector will be provided a list of defects, each of which is described further as observations. These observations are described to various levels of severity as they relate to the effect on the life of the system.

The quantification of each deficiency is identified by the inspector using the associated unit of measure. Once an observation is populated with a deficient quantity, the inspector will be requested to provide information on component type and location.

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The installation date or age of the component may be preloaded into the WBS for each asset from the Real Property Inventory List or site specific information. This can be overridden by the inspector, Site CAIS personnel, or Facility Manager.

B. Location

Level I and II inspections will be located by the inspector through a discrete entry into the Data Collection Device. The "IU" or component location will be derived from Facility-supplied segment numbering lists, maps or other I.D. numbering systems. For building associated "IU's" and components the Facility shall furnish plans annotated with room number schedules. In the case of non-room associated components, plans will be orientated with the top of each sheet being the north direction, so as to allow directional location and description. In the case where no maps, or plans are available the inspector shall enter a brief (65 character) description of location.

III. INSPECTOR QUALIFICATIONS

Inspector qualifications for Airfield include:

Minimum 5 years experienced journeyman for other than pavements. The personnel performing Level I inspections of Pavements should have a minimum of 5 years experience in inspecting similar surfaces. In addition, the inspector(s) must be experienced in readily identifying various defects outlined in this manual.

IV. INSPECTION UNIT (IU)

A. Pavement Subsystem

Because of the type, length and area of the airfield pavements involved on a installation, the pavement should be divided into areas with different uses such as runways, taxiways, and aprons on the airport layout plan. Divide each single use area into sections base on the pavement design, construction history, traffic, and generally the same overall condition. General sections can be determined from pavement design and construction records and can be further subdivided as deemed necessary based on a preliminary survey. It is important that all pavement in a given section be such that it can be considered uniform. For example, the center part of some runways in the traffic lanes should be separate section from the portions outside the traffic lanes. Each pavement section is further divided into sample units. Either all or some sample units may be selected for inspection.

Sample unit sizes should be 5,000 square feet (generally 50 by 100 feet) for flexible pavement and 20 adjacent slabs for rigid pavements. However, as necessary the following sample unit size variation is acceptable: flexible pavement 5000 SF $\pm$ 2000 SF if the pavement is not evenly divided by 5000; rigid pavement 20 $\pm$ 8 slabs if the total number of slabs in the section is not evenly divided by 20.

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As a minimum, inspect the following sample units, which should be spaced at approximately equal intervals. The location of the first sample unit can be selected randomly:

Sample Units	Inspect
1 to 5	1 unit
6 to 10	2 units
11 to 15	3 units
16 to 40	4 units
over 40	10% units

Additional sample units may be selected and inspected if the inspector determines that nonrepresentative distresses are present in sample units which were not inspected.

Inspection Actions

Asphalt Surfaced Pavement

- Sample units should be permanently marked so that they can be accessed at later dates.
- Measure the length of the sample unit by hand odometer. Inspect the selected sample unit and identify types of physical distresses existing in the pavement.
- Note the level of severity for each distress type to assess degree of deterioration. Measure each distress at each sample unit.
- Add up the total quantity of each distress type at each severity level.

Concrete Surfaced Pavement

- Divide each inspection unit (sample unit) into a number of slabs at joints. If the joint spacing is greater than 25 feet, limit the sample unit to a maximum slab length of 25 feet. Sample units should be permanently marked so that they can be accessed at later dates.
- Measure the length of the sample unit by hand odometer. Inspect each slab and identify types of physical distresses existing in each slab.
- Note level of severity for each distress type to assess degree of deterioration.
- Add up the total quantity of each distress type at each severity level within each slab at each sample unit.

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B. All Other Subsystems

The inspection unit (IU) is defined at the component level. If the unit of measure at the component level is "each", then the IU is "each" (e.g., Circuit Breaker). If the unit of measure is "linear feet", the IU is determined by the identification of location and the IU quantity is the total area of that component that exists at that location (e.g., 15 linear feet of conduit in room No. XXX).

IU's may be one occurrence of a component (e.g., a circuit breaker) or multiple occurrence of a single component (e.g., multiple Circuit Breakers in a single Panel Board). Defect quantities are recorded by the inspector for each observed occurrence within the discrete component (deficiency quantities are tied to each Circuit Breaker as a discrete component, but the component "Panel Board" may have only one discrete unit since it is a single system).

For example:

> The inspector locates 4 EA of damaged Circuit Breakers on a Panel Board. This quantity is recorded in the field CAIS for the component "Circuit Breaker" located by the IU defined at the component level as "Circuit Breaker." As the inspection continues on the IU, the inspector finds another 2 EA of damage. The observation is edited from 4 EA to 6 EA since it is the same defect/observation and discrete component. This can be summarized as the total quantity of deficient Circuit Breakers, 6 EA for the component "Circuit Breakers" and the subsystem "Panel Boards."

For the above example, an occurrence is defined as a defect (or observation) which is detected within the inspector's line of vision. If the inspector has multiple defects (or observations) in an occurrence within the same discrete component, the inspector will quantify the observation that is considered most severe and identify the remaining quantity under the less severe observation for the discrete component.

For Example:

> 15 LF of conduits is loose, but within that 15 LF, 4 LF is pitting. The inspector will quantify 4 LF under the observation "pitted conduit" for the defect "Corrosion" and 11 LF under the observation "loose conduit," for the defect "Physical Damage."

V. UNIT COSTS

The unit costs that are applied to the quantities recorded for each observation are contained within the site CAIS as repair cost.

VI. STANDARD SAFETY REQUIREMENTS

Prior to inspection of the pavement system, the authority having jurisdiction shall be notified to secure proper access, safety briefings and personal safety items. Inspector shall be alert for vehicle movement near and around him.

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VII. STANDARD TOOLS

Employee Identification Card - to be worn or carried during all inspections
Hand held computer
Tape measure: 50 feet
Scale
Straight edge
Hand odometer wheel
Can of spray paint

VIII. SPECIAL TOOLS AND EQUIPMENT REQUIREMENTS

Level III guide sheets will address additional tools and equipment requirements that are specific to the Level III techniques and other testing methods.

IX. LEVEL II INSPECTION METHOD KEYS

Certain observations will reference a Level II Inspection Method. The Facility Manager will be able to identify deficiencies where a Level II is flagged. The Level II Key at the observation level will refer to a specific Guide Sheet.

All Level II Guide Sheets are located at the end of each Subsystem section. A Guide Sheet Reference page precedes Level II and Level III Guide Sheets.

Level II keys are not used for Airfield Pavements because Level II is not applicable for this subsystem.

X. LEVEL III INSPECTION METHOD KEYS

Certain observations will reference a Level III inspection. The Facility Engineer will be able to identify defects where a Level III is flagged.

For pavement assets, Level III inspection and testing shall include non-destructive testing on pavement surfaces, and partially destructive testing of some or all pavement components. Testing equipment is identified in the guide sheets.

All Level III Guide Sheets are located at the end of each Subsystem section. A Guide Sheet Reference page precedes Level II and Level III Guide Sheets.

XI. REPLACEMENT COST

A replacement cost for each subsystem type will be contained within the cost estimating system in the Site CAIS.

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XII. APPENDICES

Appendix A - Abbreviations

A summary and definition of all abbreviations used in this system are contained in Appendix A which is located at the end of Airfields.

Appendix B - Glossary

A glossary of terms used in this system are contained in Appendix B which is located at the end of Airfields.

Appendix C - Life Cycles

A listing of the average life cycle durations for each assembly* in the Standard.

Note - Facility Manager's Guide

The following are included in the Facility Manager's Guide:

A table showing the required manhours to perform the standard inspection for this facility listed by Cat Code (three digit).

A listing of all Level III inspections with their estimated cost and time to perform. This list will include frequency of inspection for time driven Level III's.

* Assembly is a term describing the level at which replacement rather than repair occurs. This can be at the subsystem or component designation, depending on the system being surveyed.

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Figure 18-A. WORK BREAKDOWN STRUCTURE

SYSTEM / **SUB-SYSTEM** / **COMPONENT**

- 18 AIRFIELD
  - 18.01 Airfield Pavement
    - 18.01.01 Subgrade
    - 18.01.02 Subbase
    - 18.01.03 Base Course
    - 18.01.04 Asphalt Concrete
    - 18.01.05 Portland Cement Concrete Pavement
    - 18.01.06 Runway Overruns
  - 18.02 Airfield Lighting
    - 18.02.01 Approach Lighting
    - 18.02.02 Runway Lighting
    - 18.02.03 Taxiway Lighting
    - 18.02.04 Apron Lighting
    - 18.02.05 Mast-Type Apron Lighting
    - 18.02.06 Obstruction Lighting
    - 18.02.07 Engine-Generators
  - 18.03 Airfield Specialty Systems
    - 18.03.01 Blast Shields
    - 18.03.02 Tie Downs/Static Grounding Receptacles
  - 18.04 Airfield Lighting Vault
    - 18.04.01 Constant Current Regulators
    - 18.04.02 Series Plug Cutouts
    - 18.04.03 Circuit Selector Switches
    - 18.04.04 Radio Controllers
    - 18.04.05 Circuit Breaker (Low Voltage)
    - 18.04.06 Circuit Breaker (Medium Voltage)
    - 18.04.07 Disconnect Switches (Low Voltage)
    - 18.04.08 Disconnect Switches (Medium Voltage)
    - 18.04.09 Transfer Switches
    - 18.04.10 Transformers
    - 18.04.11 Enclosures with Bus Bars
    - 18.04.12 Lighting Fixtures - Fluorescent
    - 18.04.13 Lighting Fixtures - Incandescent
    - 18.04.14 Lighting Controllers
    - 18.04.15 Bonding
    - 18.04.16 Cable Trays
    - 18.04.17 Conduit Systems
    - 18.04.18 Wireways

18.01 AIRFIELD PAVEMENT

DESCRIPTION

Airfield Pavements and Hardstands are divided into two types: Asphalt and Concrete. Asphalt or flexible pavement structure is a combination of granular subbase, aggregate base course, and asphaltic concrete courses placed on subgrade to support the aircraft load and distribute it to the underlying soils. Concrete or rigid pavement, on the other hand, consists of Portland cement concrete slabs built over an aggregate base course and placed on subgrade. Subgrade is either compacted surface of the natural ground or compacted surface of the embankment.

Both rigid and flexible pavements transfer the load of moving aircraft and vehicles to the underlying subgrade, but in a differing manner. The load is essentially carried by structural slab in case of the rigid pavement which distributes the load over a relatively wide area of subgrade. Therefore, structural strength of the concrete is the single most important factor in the design of the rigid pavement. The load over the flexible pavement is distributed through the asphaltic and granular layered system and essentially transferred to the subgrade. Hence, the strength of the flexible pavement lies in building up thick layers, with the highest quality materials at or near surface. Thickness of these layers is highly dependent on the strength of the subgrade.

SPECIAL TOOL AND EQUIPMENT REQUIREMENTS

The following tools shall be employed during the inspection of the pavements:

Lightweight Life Safety Vest
Scale: 12 inches long that reads to 1/8 inch
Straight Edge: 10 feet
Hand Odometer Wheel: To read 0.1 ft
Spray Paint, chalk for marking
Vehicle with distance measuring device

SPECIAL SAFETY REQUIREMENTS

Since the inspection is performed by walking over the pavement, aircraft operations present a hazard. The inspection must be performed with the prior approval of the Facility Engineer who will notify the authorities to provide safety measures and safe access in coordination with airfield operations. Inspector will be required to wear international orange safety vests.

COMPONENT LIST

- 18.01.01 SUBGRADE
- 18.01.02 SUBBASE
- 18.01.03 BASE COURSE
- 18.01.04 ASPHALT CONCRETE
- 18.01.05 PORTLAND CEMENT CONCRETE PAVEMENT
- 18.01.06 RUNWAY OVERRUNS

18.01 AIRFIELD PAVEMENT

RELATED SUBSYSTEMS

Due to the related nature of the elements requiring inspection, the following DS/IMs should be reviewed for concurrent inspection activities.

19.00	PAVEMENTS/IMPROVED SURFACES (all subsystems)
18.02	AIRFIELD LIGHTING
23.03	STORM WATER COLLECTION SYSTEM

STANDARD INSPECTION PROCEDURE

Because of the type, length and area of the airfield pavements involved on a installation, the pavement should be divided into areas with different uses such as runways, taxiways, and aprons on the airport layout plan. Divide each single use area into sections base on the pavement design, construction history, traffic, and generally the same overall condition. General sections can be determined from pavement design and construction records and can be further subdivided as deemed necessary based on a preliminary survey. It is important that all pavement in a given section be such that it can be considered uniform. For example, the center part of some runways in the traffic lanes should be separate section from the portions outside the traffic lanes. Each pavement section is further divided into sample units. Either all or some sample units may be selected for inspection.

Sample unit sizes should be 5,000 square feet (generally 50 by 100 feet) for flexible pavement and 20 adjacent slabs for rigid pavements. However, as necessary the following sample unit size variation is acceptable: flexible pavement 5000 SF $\pm$ 2000 SF if the pavement is not evenly divided by 5000; rigid pavement 20 $\pm$ 8 slabs if the total number of slabs in the section is not evenly divided by 20.

As a minimum, inspect the following sample units, which should be spaced at approximately equal intervals. The location of the first sample unit can be selected randomly:

Sample Units	Inspect
1 to 5	1 unit
6 to 10	2 units
11 to 15	3 units
16 to 40	4 units
over 40	10% units

Additional sample units may be selected and inspected if the inspector determines that nonrepresentative distresses are present in sample units which were not inspected.

Individual sample units to be inspected should be marked or identified in a manner to allow inspectors and quality control personnel to easily locate them on the pavement surface. Paint marks along the edge and sketches with locations connected to physical pavement features are acceptable. the use of nails or other potential FOD sources is not recommended. It is necessary to be able to accurately relocate the sample units to allow verification of current distress data, to examine changes in condition with time of a particular sample unit if desired.

18.01 AIRFIELD PAVEMENT

The inspection shall be carried out for each pavement type listed. The inspector will identify types of physical distresses existing in the pavement, and measure the quantity of each distress. the observation contains the description of each distress and guidelines to determine the level of severity. For Level III inspection and testing items, refer to Level III Guide Sheets for inspection procedure.

COMPONENTS

◆ 18.01.01 SUBGRADE

Subgrade is the top surface of the original ground level or embankment upon which the pavement structures are constructed. Subgrade is always covered under various other components of pavement structure. See Level III Guide Sheets for inspection procedures.

◆ 18.01.02 SUBBASE

Subbase is the layer or layers of selected material of designated thickness placed on a subgrade to support a base course. It consists of a compacted layer locally available natural granular material, either treated or untreated. Subbase remains covered under various other pavement components. See Level III Guide Sheets for inspection procedures.

◆ 18.01.03 BASE COURSE

Base Course is the layer or layers of selected material of designed thickness placed on a subbase or a subgrade to support a surface course. Base course material generally consists of high quality processed crushed aggregate. When stabilized base course is required, it may include asphaltic concrete base, portland concrete base, and cement-treated base.

Base course is an essential structural component of the flexible pavement. It is, however, not considered a part of the rigid pavement structural thickness and is used for various purposes, such as control of pumping; control of frost action; and drainage.

Base course remains covered beneath pavement surface. See Level III Guide Sheets for inspection procedures.

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.04 ASPHALT CONCRETE (AC)

Asphalt concrete is the surface course of a flexible pavement structure and consists of a mixture of mineral aggregates and bituminous materials placed in one or more layers to accommodate the aircraft load. The top asphalt layer of flexible pavement is called "wearing course", and in addition to its major function as a structural portion of the pavement, it is designed to resists skidding, traffic abrasion, and the disintegrating effects of climate.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Alligator or Fatigue Cracking:** When two or three levels of severity exist within one distressed area and if these can be easily distinguished from each other, they should be measured and recorded separately. However, if the different levels of severity cannot be easily divided, the entire area should be rated at the highest severity level present.			
Observation:			
a. Longitudinal disconnected hairline cracks running parallel to each other. The cracks are not spalled. Initially there may only be a single crack in the wheel path. *** {Severity L}	SF		1
b. Further development of low-severity alligator cracking into a pattern of pieces formed by cracks that may be lightly surface-spalled. *** {Severity M}	SF		1
c. Medium alligator cracking has progressed so that pieces are more severely spalled at the edges and loosened until the cells rock under traffic. Pumping may also exist. *** {Severity H}	SF		1

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.04 ASPHALT CONCRETE (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Asphalt Bleeding:** Bleeding is a film of bituminous material on the pavement surface that creates a shiny, glass-like reflecting surface that usually becomes quite sticky. Bleeding is caused by excessive amounts of asphaltic cement or tars in the mix or low-air void content, or both. It occurs when asphalt fills the voids of the mix during hot weather and then expands out onto the surface of the pavement. Since the bleeding process is not reversible during cold weather, asphalt or tar will accumulate on the surface.			
Observation: a. Bleeding has only occurred to a very slight degree and it is noticeable only during a few days a year. Asphalt does not stick to shoes or vehicles. *** {Severity L}	SF		
b. Bleeding has occurred to the extent that asphalt sticks to shoes and vehicles during only a few weeks of the year. *** {Severity M}	SF		
c. Bleeding has occurred extensively and considerable asphalt sticks to shoes and vehicles during at least several weeks of the year. *** {Severity H}	SF		

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ **18.01.04 ASPHALT CONCRETE (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Block Cracking:** Block cracks are interconnected cracks that divide the pavement into approximately rectangular pieces. The blocks may range in size from approximately 1ft by 1ft to 10ft by 10ft. Block cracking is caused mainly by shrinkage of the asphalt concrete and daily temperature cycling. It is no load associated.			
Observation: a. Blocks are defined by non-sealed cracks that are nonspalled (sides of the crack are vertical) or lightly spalled, causing no FOD potential. Non filled cracks have ¼-inch or less mean width and filled cracks have filler in satisfactory condition. *** {Severity L}	SF		
b. Blocks are defined by either: filled or non filled cracks that are moderately spalled (some FOD potential), non filled cracks that are not spalled or have only minor spalling, but have a mean width greater than approximately 1/4 in.; or filled cracks greater than 1/4 in. that are not spalled or have only minor spalling, but have filler in unsatisfactory condition. *** {Severity M}	SF		
c. Blocks are well defined by cracks that are severely spalled. (Definite FOD potential) *** {Severity H}	SF		

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.04 ASPHALT CONCRETE (Continued)

Defect:

*** Corrugation:**
Corrugation is a series of closely spaced ridges and valleys (ripples) occurring at fairly regular intervals (usually less than 5 ft) along the pavement. The ridges are perpendicular to the traffic direction. Determine the mean elevation difference using a 10-ft straight edge by placing it perpendicular to the corrugations so that the depth of the valleys can be measured in inches. The mean depth is calculated from five measurements.

Observation:	UOM	LEVEL II KEY	LEVEL III KEY
a. Mean El. difference is less than 1/4 in. for runways and high speed taxiways. *** {Severity L}	SF		
b. Mean El. difference is less than 1/2 in. for taxiways and aprons. *** {Severity L}	SF		
c. Mean El. difference is between 1/4 to 1/2 in. for runways and high speed taxiways. *** {Severity M}	SF		
d. Mean El. difference is between 1/2 to 1 in. for taxiways and aprons. *** {Severity M}	SF		
e. Mean El. difference greater that 1/2 in. for runways and high speed taxiways. *** {Severity H}	SF		1
f. Mean El. difference is greater than 1 in. for taxiways and aprons. *** {Severity H}	SF		1

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.04 ASPHALT CONCRETE (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Depression:** Depressions are localized pavement surface areas having elevations slightly lower than those of the surrounding pavement. In many instances, light depressions are not noticeable until after a rain, when ponding water creates "birdbath" areas; but the depressions can also be located without rain because of stains created by ponding water. The maximum depth of the depression determines the severity. This depth can be measured by placing a 10-ft straightedge across the depressed area and measuring the maximum depth in inches.			
Observation: a. Depression can be observed or located by stained areas, only slightly affects pavement riding quality. Maximum Depth of Depression: Runways & High Speed TW 1/8"to 1/2" Taxiways & Aprons 1/2" to 1" *** {Severity L}	SF		
b. Depressions may cause hydroplaning potential on runways. Maximum Depth of Depression: Runways & High Speed TW 1/2" to 1" Taxiways & Aprons 1" to 2" *** {Severity M}	SF		
c. Definite hydroplaning potential on runways. Maximum Depth of Depression: Runways & High Speed TW > 1" Taxiways & Aprons > 2" *** {Severity H}	SF		1

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.04 ASPHALT CONCRETE (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Jet-blast Erosion:** Causes darkened areas on the pavement surface where bituminous binder has been burned or carbonized. Localized burned areas may vary in depth up to approximately 1/2 in.			
Observation:			
a. Jet-blast erosion exists on runway ***{Severity L}	SF		

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.04 ASPHALT CONCRETE (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
***Joint Reflection Cracking:** This distress occurs only on pavements having an asphalt or tar surface over a portland cement concrete (PCC) slab. Joint reflection cracking is caused mainly by movement of the PCC slab beneath the asphalt concrete surface.			
Observation:			
a. Cracks have only light spalling (little or no FOD potential)or no spalling, and can be filled or non-filled. If non-filled, the cracks have a mean width of 1/4 in. or less; filled cracks are of any width, but their filler material is in satisfactory condition. ***{Severity L}	LF		
b. One of the following conditions exists: Cracks are moderately spalled (some FOD potential) and can either be filled or non-filled of any width; filled cracks are not spalled or are lightly spalled, but filler is in unsatisfactory condition; non-filled cracks are not spalled or are only lightly spalled, but the mean crack width is greater than 1/4 in.; or light random cracking exists near the crack or at the corners of intersecting cracks. ***{Severity M}	LF		
c. Cracks are severely spalled with pieces loose or missing causing definite FOD potential. Cracks can be either filled or non-filled of any width. ***{Severity H}	LF		1

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.04 ASPHALT CONCRETE (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Longitudinal and Transverse Cracking:** (Non-PCC Joint Reflective) Longitudinal cracks are parallel to the pavement's center line or laydown direction. Transverse cracks extend across the pavement at approximately right angles to the pavement's center line or direction of laydown. The length and severity of each crack should be identified and recorded. If the crack does not have the same severity level along its entire length, each portion of the crack having a different severity level should be recorded separately. For example, see "Joint Reflection Cracking." If block cracking is recorded, longitudinal and transverse cracking is not recorded in the same area.			
Observation:			
a. Cracks have only light spalling (little or no FOD potential) or no spalling and can be filled or non-filled. If non-filled, the cracks have a mean width of ¼-inch or less; filled cracks are of any width, but their filler material is in satisfactory condition to substantially prevent water infiltration.	LF		
*** {Severity L}			
b. Filled cracks are not spalled or are lightly spalled, but filler is in unsatisfactory condition.	LF		
*** {Severity L}			
c. Non-filled cracks are not spalled or are only lightly spalled, but the mean crack width is greater than ¼-inch.	LF		
*** {Severity L}			
d. Cracks are moderately spalled (some FOD potential) and can be either filled or non-filled of any width.	LF		
*** {Severity M}			
e. Light random cracking exists near the crack at the corners of intersecting cracks.	LF		1
***{Severity M}			

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ **18.01.04 ASPHALT CONCRETE (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Longitudinal and Transverse Cracking (Continued):**			
Observation:			
f. Cracks are severely spalled and pieces are loose or missing causing definite FOD potential. Cracks can be either filled or non-filled of any width. ***{Severity H}	LF		1

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Porous Friction Courses:**			
Severity Levels:			
a. Average raveled area around the crack is less then 1/4" wide ***{Severity L}	LF		
b. Average raveled area around the crack is between 1/4" and 1 in. ***{Severity M}	LF		
c. Average raveled area around crack is greater than 1 in. ***{Severity H}	LF		1

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.04 ASPHALT CONCRETE (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Oil Spillage:** Oil spillage is the deterioration or softening of the pavement surface caused by the spilling of oil, fuel, or other solvents.			
Observation:			
a. Oil spillage present on pavement ***{Severity L}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Patching and Utility Cut Patch:**			
Observation:			
a. Patch is in very good condition and is performing satisfactorily. *** {Severity L}	SF		
b. Patch is somewhat deteriorated and affects ride quality to some extent; have low to medium levels of any types of distress; has FOD potential. *** {Severity M}	SF		
c. Patch is badly deteriorated and significantly affects ride quality; soon needs replacement; has high FOD potential. *** {Severity H}	SF		

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.04 ASPHALT CONCRETE (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Polished Aggregate:** Polished aggregate is present when close examination of a pavement reveals that the portion of aggregate extending above the asphalt is either very small, or there are no rough or angular aggregate particles to provide good skid resistance. The existence of polishing can be detected by both visually observing and running the fingers over the surface. This defect is applicable to runways and high speed taxiways.			
Observation:			
a. Aggregate extending above the pavement is negligible, and the surface aggregate is smooth to the touch. *** {Severity L}	SF		
b. Pavement surface is smooth and has a distinctive dull finish. *** {Severity M}	SF		
c. Pavement surface appears highly smooth and the aggregate are highly polished. *** {Severity H}	SF		3

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.04 ASPHALT CONCRETE (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Raveling and Weathering:** Raveling and weathering are the wearing away of the pavement surface caused by the dislodging of aggregate particles and loss of asphalt or tar binder.			
Observation:			
a. Aggregate or binder has started to wear away but has not progressed significantly and presents little or no FOD potential. *** {Severity L}	SF		
b. Aggregate and/or binder has worn away and the surface texture is moderately rough and pitted. Loose particles generally exist causing FOD potential. *** {Severity M}	SF		
c. Aggregate and/or binder has worn away and the surface texture is severely rough and pitted causing high FOD potential. *** {Severity H}	SF		

Defect:

	UOM	LEVEL II KEY	LEVEL III KEY
*** Rutting:** Rutting severity is determined by the mean depth of the rut. To determine the mean depth, a 4-foot straight edge should be laid across the rut and the maximum depth measured. The mean depth should be computed from measurements taken every 20 feet along the length of the rut.			
Observation: Mean Rut Depth Criteria			
a. ¼ - ½ in. *** {Severity L}	SF		
b. Greater than ½ - 1 in. *** {Severity M}	SF		1
c. Greater than 1 in. *** {Severity H}	SF		1

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.04 ASPHALT CONCRETE (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Shoving:** PCC pavements occasionally increase in length at ends where they adjoin flexible pavements. This "growth" shoves the asphalt- or tar-surfaced pavements, causing them to swell and crack.			
Observation:			
a. Height differential is less than 3/4". *** {Severity L}	SF		
b. Height differential is between 3/4" and 1 1/2". *** {Severity M}	SF		
c. Height differential is greater than 1 1/2". *** {Severity H}	SF		1

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Slippage Cracking:** Slippage cracks are crescent- or half-moon-shaped cracks having two ends pointed away from the direction of traffic.			
Observation:			
a. Slippage crack exists. *** {Severity H}	SF		

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.04 ASPHALT CONCRETE (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Swelling:** Swell is characterized by an upward bulge in the pavement surface. A swell may occur sharply over a small area or as a longer, gradual wave. Either type of swell can be accompanied by surface cracking. Determine the height differential by placing a 10-ft straightedge on the highest point of the swell such that both ends are equal distance above the pavement.			
Observation:			
a. Swell is barely visible and has a minor effect on the pavement's ride quality. Height differential is less than 3/4 in. for runways and high speed taxiways. *** {Severity L}	SF		
b. Height differential is less than 1-1/2 in. for taxiways and aprons. *** {Severity L}	SF		
c. Swell can be observed without difficulty and has a significant effect on pavement's ride quality. Height differential is between 3/4 to 1-1/2 in. for runways and high speed taxiways. *** {Severity M}	SF		
d. Height differential is between 1-1/2 and 3 in. for taxiways and aprons. *** {Severity M}	SF		
f. Swell can be readily observed and severely affects the pavement's ride quality. Height differential is greater than 1-1/2 in. for runways and high speed taxiways. *** {Severity H}	SF		
g. Height differential is greater than 3 in. for taxiways and aprons. *** {Severity H}	SF		

18.01 AIRFIELD PAVEMENT

COMPONENTS

◆ 18.01.05 PORTLAND CEMENT CONCRETE PAVEMENT

The basic materials in the pavement slab are portland cement concrete, reinforcing steel, load transfer devices, and joint sealing materials.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Blow-up:** Blowups occur in hot weather, usually at a transverse crack or joint that is not wide enough to permit expansion of the concrete slabs.			
Observation:			
a. Blow-up has occurred resulting in only a slight amount of roughness. Difference in elevation for runways and high speed taxiways is less than 1/2 in. *** {Severity L}	SF		
b. Difference in elevation for aprons and other taxiways is less than 1 in. *** {Severity L}	SF		
c. Blow-up has resulted in a significant amount of roughness. Difference in elevation for runways and high speed taxiways is between 1/2 to 1 in. *** {Severity M}	SF		2
d. Difference in elevation for aprons and other taxiways is between 1 to 2 in. *** {Severity M}	SF		2
e. Blow-up has rendered the pavement inoperable. *** Severity H}	SF		2

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.05 PORTLAND CEMENT CONCRETE PAVEMENT (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corner Break:** A corner break is a crack that intersects the joints at a distance less than or equal to one half of the slab length on both slabs, measured from the corner of the slab. A distress slab is recorded as one slab if it contains a single corner break, contains more than one break of a particular severity, or contains two or more breaks of different severities. For two or more breaks, the highest level of severity should be recorded.			
Observation:			
a. Crack has little or minor spalling (no FOD potential). If non-filled, it has a mean width less than approximately 1/8 in. A filled crack can be of any width but the filler material must be in satisfactory condition. The area between the corner break and the joints is not cracked. *** {Severity L}	EA		
b. One of the following conditions exists: (1) filled or non-filled crack is moderately spalled (some FOD potential); (2) a non-filled crack has a mean width between 1/8" and 1"; (3) a filled crack is not spalled or only lightly spalled, but the filler is in unsatisfactory condition; or (4) the area between the corner break and the joints is lightly cracked. *** {Severity M}	EA		2
c. One of the following conditions exists: (1) filled or non-filled crack is severely spalled, causing definite FOD potential; (2) a non-filled crack has a mean width greater than 1 in., creating a tire damage potential; or (3) the area between the corner break and the joints is severely cracked. *** {Severity H}	EA		2

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.05 PORTLAND CEMENT CONCRETE PAVEMENT(Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Longitudinal, Transverse, and Diagonal** Cracks: These cracks, that divide the slab into two or three pieces, are usually caused by a combination of load repetition, curling stresses, and shrinkage stresses. Low-severity cracks are usually warping- or friction-related and are not considered major structural distresses. Medium or high-severity cracks are usually working cracks and are considered major structural distresses. UOM is slab. Observation:			
a. Crack has little or minor spalling (no FOD potential). If filled, it has a mean width less than approximately 1/8 in. A filled crack can be of any width but the filler material must be in satisfactory condition; or the slab is divided into three pieces by low-severity cracks. *** {Severity L}	EA		
b. One of the following conditions exists: (1) filled or non-filled crack is moderately spalled (some FOD potential); (2) a non-filled crack has a mean width between 1/8 and 1 in. (3) a filled crack is not spalled or only lightly spalled, but the filler is in unsatisfactory condition; or (4) the slab is divided into three pieces or two or more cracks, one of which is at least medium severity. *** {Severity M}	EA		2
c. One of the following conditions exists: (1) filled or non-filled crack is severely spalled, causing definite FOD potential; (2) a non-filled crack has a mean width greater than approximately 1 in., creating a tire damage potential; or (3) the slab is divided into three pieces by two or more cracks, one of which is at least high severity. *** {Severity H}	EA		2

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.05 PORTLAND CEMENT CONCRETE PAVEMENT (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Durability ("D") Cracking:** "D" cracking usually appears as a pattern of cracks running parallel to a joint or linear crack. A dark coloring can usually be seen around the fine durability cracks. "D" cracking should not be counted if the fine crack pattern has not developed near cracks, joints and free edges. Popouts and discoloration of joints, cracks and free edges may occur without "D" cracking. When the distress is located and rated at one severity, it is counted as one slab. If more than one severity level is found, the slab is counted as having the higher severity distress. Observation:			
a. The characteristic pattern of closely spaced fine cracks has developed near joints, cracks, and/or free edges; however, the width of the affected area is generally less than 12 inches wide at the center of the lane in transverse cracks and joints. The crack pattern may fan out at the intersection of transverse cracks/joints with longitudinal cracks/joints. No joint/crack spalling has occurred, and no patches have been placed for "D" cracking. *** {Severity L}	EA		
b. The characteristic pattern of closely spaced cracks has developed near the crack, joint or free edge and is generally wider than 12 inches at the center of the lane in transverse cracks and/or joints. Pieces are missing and disintegration has occurred. Some FOD potential. ***{Severity M}	EA		2
c. The pattern of fine cracks has developed near joints or cracks and a high severity level of spalling at joints/cracks exists and considerable material is loose and has developed generally over the entire slab area between cracks and/or joints. *** {Severity H}	EA		2

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.05 PORTLAND CEMENT CONCRETE PAVEMENT (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Joint Seal Damage:** Joint seal damage is any condition that enables soil or rocks to accumulate in the joints or allows significant infiltration of water. A pliable joint filler bonded to the edges of the slabs protects the joints from accumulation of materials and also prevents water from seeping down and softening the foundation supporting the slab.			
Observation:			
a. Joint sealant is in good condition throughout the sample with only a minor amount of any type of six types of damage present (as described in Appendix B). Little water and no incompressible materials can infiltrate through the joint. *** {Severity L}	LF		
b. Joint sealant is in fair condition over the entire inspection unit, with one or more of the six types of damage (as described in Appendix B) occurring to moderate degree. Water can infiltrate the joint fairly easily; some incompressible materials can infiltrate the joint. Sealant needs replacement within 2 years. *** {Severity M}	LF		
c. Joint sealant is in poor condition over most of the inspection unit, with one or more of the six types of damage (as described in Appendix B) occurring to a severe degree. Water and incompressible materials can freely infiltrate the joint. Sealant needs immediate replacement. Joint seal damage is at high severity if 10% or more of the joint sealer exceeds limiting criteria, or if 10% or more of sealer is missing. *** {Severity H}	LF		

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.05 PORTLAND CEMENT CONCRETE PAVEMENT (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Small Patch Deterioration:** A patch is an area where the original pavement has been removed and replaced b a filler material. For condition evaluation, patching is divided into two types: **Small (less than 5 SF** and **Large (over 5 SF).** If one or more small patches having the same severity level are located in a slab, the UOM is recorded as one slab containing that distress. If more than one severity level occurs, it is recorded as one slab with the higher severity level.			
Observation:			
a. Small Patch has little or no deterioration. Some low severity spalling of the patch edges may exist. Faulting across the slab-patch joints must be less than ¼ inch. Patch is rated low severity even if it is in excellent condition. *** {Severity L}	EA		
b. Small Patch has cracked (low-severity level) and/or some spalling of medium-severity level exists around the edges. Faulting of ¼ to ¾ inch exists. Temporary patches may have been placed because of permanent patch deterioration. (Minor FOD potential) *** {Severity M}	EA		
c. Small Patch has deteriorated by spalling, rutting or cracking within the patch to a state that causes considerable roughness or high FOD potential warranting patch replacement. *** {Severity H}	EA		

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.05 PORTLAND CEMENT CONCRETE PAVEMENT (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Large Patch Deterioration (Patching > 5 SF in Area):**			
Observation:			
a. Large Patch has little or no deterioration. Some low severity spalling of the patch edges may exist. Faulting across the slab-patch joints must be less than ¼ inch. Patch is rated low severity even if it is in excellent condition. *** {Severity L}	EA		
b. Large Patch has cracked (low-severity level) and/or some spalling of medium-severity level exists around the edges. Faulting of ¼ to ¾ inch exists. Temporary patches may have been placed because of permanent patch deterioration. (Minor FOD potential) *** {Severity M}	EA		
c. Large Patch has deteriorated by spalling, rutting or cracking within the patch to a state that causes considerable roughness or high FOD potential warranting patch replacement. *** {Severity H}	EA		

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.05 PORTLAND CEMENT CONCRETE PAVEMENT (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Popouts:** A popout is a small piece of pavement that breaks loose from the surface due to freeze-thaw action in combination with expansive aggregates. Popouts usually range from approximately 1 to 4 in. The density of popouts can be determined by counting the number of popouts per square yard (SY) of slab surface. The average popout density must exceed approximately three popouts per SY over the entire slab area before they are counted as a distress. The UOM is the average popout density per SY over the entire slab.			
Average popout density over the entire slab: Observation:			
a. 3 to 5 popouts per SY. *** {Severity L}	EA		
b. 6-10 popouts per SY. *** {Severity M}	EA		
c. Greater than 10 popouts per SY. *** {Severity H}	EA		

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.05 PORTLAND CEMENT CONCRETE PAVEMENT (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Pumping:** Pumping is the ejection of material by water through joints or cracks caused by deflection of the slab under passing loads. As water is ejected, it carries particles of gravel, sand, clay, or silt resulting in a progressive loss of pavement support. Surface staining and base or subgrade material on the pavement close to joints or cracks are evidence of pumping. UOM is recorded as slab. One pumping joint between tow slabs is counted as two slabs. However, if the remaining joints around the slab are also pumping, one slab is added per additional pumping joint.			
Observation: a. Pumping has occurred. A significant amount of pumped materials exist on the slab surface along the joints or cracks. *** {Severity H}	EA		

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.05 PORTLAND CEMENT CONCRETE PAVEMENT (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Scaling, Map Cracking or Crazing:** Map cracking or crazing refers to a network of shallow, fine, or hairline cracks that extend only through the upper surface of the concrete. The cracks tend to intersect at angles of 120 degrees. Map cracking or crazing may lead to scaling of the surface, that is evidenced by a breakdown of the slab surface to a depth of approximately 1/4" to 1/2". The UOM is recorded as slabs. If two or more levels of severity exist on a slab, the slab is counted as one slab having the maximum level of severity. For example, if both low-severity crazing and medium scaling exist on one slab, the slab is recorded as one slab containing medium scaling. If "D" cracking is recorded, scaling is not recorded.			
Observation:			
a. Scaling, crazing or map cracking exists but is barely noticeable; the surface is in good condition with no scaling. *** {Severity L}	EA		
b. Scaling, crazing or map cracking noticeable over approximately 5% or less of the surface with some FOD potential as a result of scaling. *** {Severity M}	EA		
c. Well pronounced crazing or map cracking over more than 5% of the surface. Slab is severely scaled causing a high FOD potential. *** {Severity H}	EA		

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.05 PORTLAND CEMENT CONCRETE PAVEMENT (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Settlement or Faulting:** Settlement or faulting is a difference of elevation at a joint or crack caused by upheaval or consolidation. Severity levels are defined by the difference in elevation across the fault and the associated decrease in ride quality and safety as severity increases. The UOM is record as slab. In recording settlement, a fault between two slabs is counted as one slab. A straightedge or level should be used to aid in measuring the difference in elevation between the two slabs. Observation: Difference in elevation per each slab:			
a. Runway/Taxiway Less than 1/4" Aprons 1/8" < 1/2" *** {Severity L}	EA		
b. Runway/Taxiway 1/4" to 1/2" Aprons 1/2" to 1" *** {Severity M}	EA		
c. Runway/Taxiway Greater than 1/2" Aprons Greater than 1" *** {Severity H}	EA		2

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.05 PORTLAND CEMENT CONCRETE PAVEMENT (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Shattered Slab/Intersecting Cracks:** Intersecting cracks break the slab into four or more pieces due to overloading or inadequate support, or both. The high-severity level of this distress type is referred to as shattered slab. If all pieces or cracks are contained within a corner break, the distress is categorized as a sever corner break.			
No other distress such as scaling, spalling, or durability cracking should be recorded if the slab is medium- or high-severity level since the severity of this distress would affect the slab's rating substantially. Shrinkage cracks should not be counted in determining whether or not the slab is broken into four or more pieces.			
Observation:			
a. Slab is broken into four or five pieces with all cracks of low-severity. *** {Severity L}	EA		
b. Slab is broken into four or five pieces with over 15% of the cracks of medium-severity; slab is broken into six or more pieces with over 85% of the cracks of low severity. *** {Severity M}	EA		
c. Slab is broken into more than four pieces with some of the cracks of high severity; or slab is broken into six or more pieces with over 15% of the cracks of medium or high severity. *** {Severity H}	EA		2

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.05 PORTLAND CEMENT CONCRETE PAVEMENT (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Shrinkage Cracking:** Shrinkage cracks are hairline cracks that are usually only a few feet long and do not extend across the entire slab. They are formed during the setting and curing of the concrete and usually do not extend through the depth of the slab. The UOM is recorded as slab. If one or more shrinkage cracks exist on one particular slab, the slab is recorded as one slab with shrinkage cracks.			
Observation:			
a. Shrinkage cracks are visible with no raveling. *** {Severity L}	EA		
b. Shrinkage cracks are clearly visible with some raveling evident. ***{Severity M}	EA		
c. Shrinkage cracks have raveled or spalled. ***{Severity H}	EA		

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.05 PORTLAND CEMENT CONCRETE PAVEMENT (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Spalling (Transverse and Longitudinal Joint):** Joint spalling is the breakdown of the slab edges within 2 ft of the side of the joint. A joint spall usually does not extend vertically through the slab but intersects the joint at an angle. The UOM is recorded as slabs. If the joint spall is located along the edge of one slab, it is counted as one slab with joint spalling. If spalling is located on more than one edge of the same slab, the edge having the highest severity is counted and recorded as one slab. Joint spalling can also occur along the edges of two adjacent slabs. If this is the case, each slab is counted as having joint spalling.			
Observation:			
a. The spall does not extend more than 1 inch on either side of the joint or crack and no deeper than 1/2 inch. Spall over 2 ft long broken into no more than three pieces. Spall less than 2 ft long is broken into pieces or fragmented with little or no FOD potential. No temporary patching has been placed to repair the spall. *** {Severity L}	EA		
b. The spall extends more than 1 inch on either side of the joint or crack, or is deeper than 1/2 inch. Spall is broken into more than three pieces. Some pieces may be loose and/or missing causing considerable FOD or tire damage potential. Temporary patching may have been placed because of spalling. *** {Severity M}	EA		
c. Spall over 2 ft long. The joint is severely spalled with high-severity cracks with high FOD potential and high possibility of the pieces becoming dislodged. *** {Severity H}	EA		

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.05 PORTLAND CEMENT CONCRETE PAVEMENT (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Spalling (Corner)** Corner spalling is the raveling or breakdown of the slab within approximately 2 ft of the corner. A corner spall differs from a corner break in that the spall usually angles downward to intersect the joint, while a break extends vertically through the slab. The UOM is recorded as slabs. If one or more corner spalls having the same severity level are located in a slab, the slab is counted as one slab with corner spalling. If more than one severity level occurs, it is counted as one slab having the higher severity level.			
Observation:			
a. Spall is broken into one or two pieces defined by low-severity cracks or by one medium-severity crack with little or no FOD potential or spall is defined by one medium-severity crack. No temporary patching has been placed to repair the spall. *** {Severity L}	EA		
b. Spall is broken into two or more pieces defined by medium-severity cracks, and a few small fragments may be absent or loose, or one sever, fragmented crack that may be accompanied by a few hairline cracks, or spall has deteriorated to the point where loose material is causing some FOD potential. Temporary patching may have been placed because of spalling. *** {Severity M}	EA		
c. Spall is broken into two or more pieces defined by high-severity fragmented cracks with loose or absent fragments; pieces of the spall have been displaced to the extent that a tire damage hazard exists; or spall has deteriorated to the point where loose material is causing high FOD potential. *** {Severity H}	EA		

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.06 RUNWAY OVERRUNS

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Eroded Earth Shoulders:**			
Observation:			
a. Small amounts of ponding water or evidence of ponding water on the surface.	SF		
*** {Severity L}			
b. Moderate amounts of ponding water or evidence of ponding water on the surface.	SF		
*** {Severity M}			
c. Large amounts of ponding water or evidence of ponding water on the surface.	SF		
*** {Severity H}			

Defect:

*** Eroded Gravel Shoulders:**

Observation:

a. Small amounts of ponding water or evidence of ponding water on the surface.	SF
*** {Severity L}	
b. Moderate amounts of ponding water or evidence of ponding water on the surface.	SF
*** {Severity M}	
c. Large amounts of ponding water or evidence of ponding water on the surface.	SF
*** {Severity H}	

Defect:

*** Soft and Spongy Earth Shoulders:**

Observation:

a. Small amounts of ponding water or evidence of ponding water on the surface.	SF
*** {Severity L}	
b. Moderate amounts of ponding water or evidence of ponding water on the surface. Surface appears soft when walked on.	SF
*** {Severity M}	
c. Large amounts of ponding water or evidence of ponding water on the surface. Surface is very soft when walked on.	SF
*** {Severity H}	

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.06 RUNWAY OVERRUNS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Soft and Spongy Earth Overruns:**			
Observation:			
a. Small amounts of ponding water or evidence of ponding water on the surface.	SF		
*** {Severity L}			
b. Moderate amounts of ponding water or evidence of ponding water on the surface. Surface appears soft when walked on.	SF		
*** {Severity M}			
c. Large amounts of ponding water or evidence of ponding water on the surface. Surface is very soft when walked on.	SF		
*** {Severity H}			

Defect:

	UOM	LEVEL II KEY	LEVEL III KEY
*** Improper Cross Section:**			
Observation:			
a. Small amounts of ponding water or evidence of ponding water on the surface.	SF		
*** {Severity L}			
b. The surface is completely flat (no cross-slope).	SF		
*** {Severity L}			
c. Moderate amounts of ponding water or evidence of ponding water on the surface.	SF		
*** {Severity M}			
d. The surface is bowl-shaped.	SF		
*** {Severity M}			
e. Large amounts of ponding water or evidence of ponding water on the surface.	SF		
*** {Severity H}			
f. The surface contains severe depressions.	SF		
*** {Severity H}			

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.06 RUNWAY OVERRUNS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Inadequate Runway Side Drainage:**			
Observation:	SF		
a. Small amounts of ponding water or evidence of ponding in the ditches.			
*** {Severity L}	SF		
b. Small amount of overgrowth or debris in the ditches.			
*** {Severity L}	SF		
c. Moderate amounts of ponding water or evidence of ponding water on the surface.			
*** {Severity M}	SF		
d. Moderate overgrowth or debris in the ditches.			
*** {Severity M}	SF		
e. Moderate erosion of the ditches into shoulders or overruns.			
*** {Severity M}	SF		
f. Large amounts of ponding water or evidence of ponding water in the ditches.			
*** {Severity H}	SF		
g. Large amounts of water running across or down the surface.			
*** {Severity H}	SF		
h. Large overgrowth or debris in the ditches.			
*** {Severity H}	SF		
i. Large erosion of the ditches into the shoulders or overruns.			
*** {Severity H}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrugated Shoulders:**			
Observation:	SF		
a. Corrugations are less that 1 in. deep.			
*** {Severity L}	SF		
b. Corrugations are between 1 and 3 inches deep.			
*** {Severity M}	SF		
c. Corrugations are deeper than 3 inches.			
*** {Severity H}			

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.06 RUNWAY OVERRUNS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrugated Overruns:**			
Observation:			
a. Corrugations are less than 1 in. deep.	SF		
*** {Severity L}			
b. Corrugations are between 1 and 3 in. deep.	SF		
*** {Severity M}			
c. Corrugations are deeper than 3 inches.	SF		
*** {Severity H}			

Defect:

*** Potholes:**
(If the potholes are over 3 feet in diameter, the area should be determined in SF and divided by 7 to find the equivalent number of potholes)

Observation:	UOM
a. Pothole diameter less than 2 feet max., depth less than 2 inches.	EA
*** {Severity L}	
b. Pothole diameter less than 1 foot max., depth less than 4 inches.	EA
*** {Severity L}	
c. Pothole diameter equal to or greater than 2 feet max., depth less than 2 inches.	EA
*** {Severity M}	
d. Pothole diameter less than 2 feet max., depth equal to or less than 4 inches.	EA
*** {Severity M}	
e. Pothole diameter less than 1 foot max., depth greater than 4 inches.	EA
*** {Severity M}	
f. Pothole diameter equal to or greater than 2 feet max., depth equal to or less than 4 inches.	EA
*** {Severity H}	
g. Pothole diameter equal to or greater than 1 foot max., depth greater than 4 inches.	EA
*** {Severity H}	

18.01 AIRFIELD PAVEMENT

COMPONENTS (Continued)

◆ 18.01.06 RUNWAY OVERRUNS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Rutting:**			
Observation:			
a. Ruts are less than 1 in. deep.	SF		
*** {Severity L}			
b. Ruts are between 1 and 3 in. deep.	SF		
*** {Severity M}			
c. Ruts are deeper than 3 in.	SF		
*** {Severity H}			

Defect:

*** Loose Aggregates:**			
Observation:			
a. Loose aggregate on the surface.	LF		
*** {Severity L}			
b. Aggregate berm less than 2 in. deep on the shoulder or overruns.	LF		
*** {Severity L}			
c. A large amount of loose aggregate on the surface.	LF		
*** {Severity M}			
d. Aggregate berm between 2-4 inches deep on the shoulder or overruns.	LF		
*** {Severity M}			
e. Aggregate berm greater than 4 inches deep on the shoulder or overruns.	LF		
*** {Severity H}			

18.01 AIRFIELD PAVEMENT

REFERENCES

1. AASHTO Guide for Design of Pavement Structures, 1986

2. TM 5-623, Pavement Maintenance Management, November 1982

3. Principals of Pavement Design, E. J. Yoder, John Wiley & Sons, Inc.

4. Micro PAVER, User's Guide, Version 3.0, U.S. Army Corps of Engineers, Construction Engineering Research Laboratory, January 1992

5. ASTM D 5340 - 93, Standard Test Method for Airport Pavement Condition Index Surveys

6. TM 5-826-6/ AFR 93-5, Procedures for US Army and US Air Force Airfield Condition Surveys, July 1989

18.01 AIRFIELD PAVEMENT

LEVEL II KEY	GUIDE SHEET CONTROL NUMBER
N/A	

LEVEL III KEY	GUIDE SHEET CONTROL NUMBER
1	GS-III 18.01.04-1
2	GS-III 18.01.05-2
3	GS-III 18.01.04-3

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 1

COMPONENT: ASPHALT CONCRETE PAVEMENT
CONTROL NUMBER: GS-III 18.01.04-1

Application

This guide applies to investigation and testing of asphalt concrete airfield pavement runways, taxiways, parking aprons, and hardstands to determine their structural capacity and remaining pavement life.

Special Safety Requirements

Passing aircraft/traffic and noise is a hazard. LEVEL III inspection and testing must be performed with the prior approval of the Facility Manager who will notify the authorities to provide safety measures and safe access to the airfield.

Inspection Action

Results of LEVEL I inspection yield a measure of surface integrity of the pavement surfaces. Although LEVEL I inspection methodology is very useful for maintaining the pavement systems of the base, its analyses, however, cannot determine structural capacity of the pavement. When the pavement condition dictates that its rehabilitation may be required, then a more extensive LEVEL III Non-Standard Inspection is essential. Level III inspection requires the use of Non-Destructive Testing (NDT) Techniques to measure pavement deflection, and partially destructive testing of one or more pavement components to determine component properties and strength. NDT equipment includes a Falling Weight Deflectometer.

NDT technique can be used to detect voids under the pavement by the use of Ground Penetrating Radar equipment and Infrared Thermography Method. Partially destructive techniques include sample coring through asphalt pavements to determine thickness, strength, and composition.

Special Tools and Equipment Requirements

Standard testing equipment required to perform the NDT and/or partially destructive testing.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 1 (Continued)

COMPONENT: ASPHALT CONCRETE PAVEMENT(Continued)
CONTROL NUMBER: GS-III 18.0.04-1

Recommended Inspection Frequency

Level III inspection will only be performed when either of the following defects are identified by the Level I inspection requiring the need of such inspection:

- Alligator Cracking
- Corrugation
- Depression
- Joint Reflection Cracking
- Longitudinal and Transverse Cracking
- Rutting
- Shoving

References

1. AASHTO Guide for Design of Pavement Structures, 1986

2. TM 5-623, Pavement Maintenance Management, November 1982

3. Principals of Pavement Design, E. J. Yoder, John Wiley & Sons, Inc.

4. Micro PAVER, User,s Guide, Version 3.0, U.S. Army Corps of Engineers, Construction Engineering Research Laboratory, January 1992

5. ASTM D 5340 - 93, Standard Test Method for Airport Pavement Condition Index Surveys

6. TM 5-826-6/ AFR 93-5, Procedures for US Army and US Air Force Airfield Condition Surveys, July 1989

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 2

COMPONENT: PORTLAND CEMENT CONCRETE PAVEMENT
CONTROL NUMBER: GS-III 18.01.05-2

Application

This guide applies to investigation and testing of portland cement concrete airfield pavement runways, taxiways, parking aprons, and hardstands to determine their structural capacity and remaining pavement life.

Special Safety Requirements

Passing aircraft/traffic and noise is a hazard. LEVEL III inspection and testing must be performed with the prior approval of the Facility Manager who will notify the authorities to provide safety measures and safe access to the airfield.

Inspection Action

Results of LEVEL I inspection yield a measure of surface integrity of the pavement surfaces. Although LEVEL I inspection methodology is very useful for maintaining the pavement systems of the base, its analyses, however, cannot determine structural capacity of the pavement. When the pavement condition dictates that its rehabilitation may be required, then a more extensive LEVEL III Non-Standard Inspection is essential. Level III inspection requires the use of Non-Destructive Testing (NDT) Techniques to measure pavement deflection, and partially destructive testing of one or more pavement components to determine component properties and strength. NDT equipment includes a Falling Weight Deflectometer.

NDT technique can be used to detect voids under the pavement by the use of Ground Penetrating Radar equipment. Partially destructive techniques include sample coring through concrete pavements to determine thickness, strength, and composition.

Special Tools and Equipment Requirements

Standard testing equipment required to perform the NDT and/or partially destructive testing.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 2 (Continued)

COMPONENT: PORTLAND CEMENT CONCRETE PAVEMENT(Continued)
CONTROL NUMBER: GS-III 18.01.05-2

Recommended Inspection Frequency

Level III inspection will only be performed when either of the following defects are identified by the Level I inspection requiring the need of such inspection:

- Blowup
- Corner Break
- Cracks; Longitudinal, Transverse, and Diagonal
- Durability ("D") Cracking
- Settlement or Faulting
- Shattered Slab/Intersecting Cracks

References

1. AASHTO Guide for Design of Pavement Structures, 1986

2. TM 5-623, Pavement Maintenance Management, November 1982

3. Principals of Pavement Design, E. J. Yoder, John Wiley & Sons, Inc.

4. Micro PAVER, User,s Guide, Version 3.0, U.S. Army Corps of Engineers, Construction Engineering Research Laboratory, January 1992

5. ASTM D 5340 - 93, Standard Test Method for Airport Pavement Condition Index Surveys

6. TM 5-826-6/ AFR 93-5, Procedures for US Army and US Air Force Airfield Condition Surveys, July 1989

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 3

COMPONENT: ASPHALT CONCRETE PAVEMENT
CONTROL NUMBER: GS-III 18.01.04-3

Application

This guide applies to investigation and testing of asphalt concrete airfield pavement runways and high-speed taxiways to determine their skid resistance potential.

Special Safety Requirements

Passing aircraft/traffic and noise is a hazard. LEVEL III inspection and testing must be performed with the prior approval of the Facility Manager who will notify the authorities to provide safety measures and safe access to the airfield.

Inspection Action

Results of LEVEL I inspection yield a measure of surface integrity of the pavement surfaces. Although LEVEL I inspection methodology is very useful for maintaining the pavement systems of the base, its analyses, however, cannot determine the skid resistance potential of the runway and high-speed taxiway. When the pavement condition dictates that its corrective action may be required, then a more extensive LEVEL III Non-Standard Inspection is essential. Level III inspection requires the use of Non-Destructive Testing (NDT) Techniques to measure the skid resistance. The testing methods are outlined in FAA Advisory Circular 150-5320-12A, Measurement, Construction and Maintenance of Skid Resistant Airfield Pavement Surfaces.

Partially destructive techniques include sample coring through asphalt pavements to determine thickness, strength, and composition.

Special Tools and Equipment Requirements

Standard testing equipment required to perform the NDT and/or partially destructive testing.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 3 (Continued)

COMPONENT: ASPHALT CONCRETE PAVEMENT(Continued)
CONTROL NUMBER: GS-III 18.0.04-3

Recommended Inspection Frequency

Level III inspection will only be performed when the following defect is identified by the Level I inspection requiring the need of such inspection:

- Polished Aggregate

References

1. AASHTO Guide for Design of Pavement Structures, 1986

2. TM 5-623, Pavement Maintenance Management, November 1982

3. Principals of Pavement Design, E. J. Yoder, John Wiley & Sons, Inc.

4. Micro PAVER, User,s Guide, Version 3.0, U.S. Army Corps of Engineers, Construction Engineering Research Laboratory, January 1992

5. ASTM D 5340 - 93, Standard Test Method for Airport Pavement Condition Index Surveys

6. TM 5-826-6/ AFR 93-5, Procedures for US Army and US Air Force Airfield Condition Surveys, July 1989

7. FAA Advisory Circular No. 150-5320-12A

18.02 AIRFIELD LIGHTING

DESCRIPTION

Airfield lighting are guidance systems used to assist aircraft in landing, taxiing, and parking at airfields.

SPECIAL TOOL AND EQUIPMENT REQUIREMENTS

No special tools are needed for the inspection of the Lighting systems, beyond the requirements listed in the Airfield Systems Standard Tools Section.

SPECIAL SAFETY REQUIREMENTS

No special safety requirements are needed for the inspection of the lighting systems, beyond the requirements listed in the Master Safety Plan and System Safety Section.

COMPONENT LIST

- 18.02.01 APPROACH LIGHTING
- 18.02.02 RUNWAY LIGHTING
- 18.02.03 TAXIWAY LIGHTING
- 18.02.04 APRON LIGHTING
- 18.02.05 MAST-TYPE APRON LIGHTING
- 18.02.06 OBSTRUCTION LIGHTING
- 18.02.07 ENGINE-GENERATORS

RELATED SUBSYSTEMS

Due to the related nature of the elements requiring inspection, the following DS/IM's should be reviewed for concurrent inspection activities.

18.01	AIRFIELD PAVEMENT
29.00	SITE ELECTRICAL (all subsystems)
29.06	EXTERIOR LIGHTING SYSTEM

STANDARD INSPECTION PROCEDURE

The standard inspection procedure for this subsystem is a visual inspection of each Lighting system, augmented by a LEVEL II Inspection when required. Very few LEVEL II or III inspection keys are indicated for the Lighting subsystem. Some inspections may require the inspector to utilize a ladder or similar device to observe defect/observations above/below the inspectors normal line of sight. The inspections may have to occur at night in order to properly verify the operation of some types of lighting. The inspection should be carried out in order of presentation of the various components. Associated defects and observations are listed which will be presented in the inspector's Data Collection Device (DCD).

18.02 AIRFIELD LIGHTING

The IU is defined at the component level. The unit of measure at the component level is each, (e.g., Approach Light fixture). Since the unit of measure is each, the IU is determined by the identification of location (e.g., North approach, or South approach).

For Example: The inspector locates 2 approach light fixtures with scratched lenses. This quantity is recorded in the field CAIS for the component "Airfield Lighting - Approach Lighting" located by the IU defined at the component level as "Approach Lighting," and a quantity of 2 is entered for the observation "Lens scratched/discolored. As the inspection continues on the IU, the inspector finds another damaged approach light fixture. The observation is edited from 2 EA to 3 EA since it is the same defect/observation and discrete component. This can be summarized as the total quantity of deficient Approach Lighting. If, however, each approach light fixture has a different defect/observation, each fixture would be recorded as separate IU's.

For the above example, an occurrence is defined as a defect (or observation) which is detected within the inspector's line of vision. If the inspector has multiple defects (or observations) in an occurrence within the same discrete component, the inspector will quantify the observation that is considered most severe and identify the remaining quantity under the less severe observation for the discrete component.

For Example: An approach light has a cracked lens and a broken housing. The inspector will record 1 EA under "Len cracked, seal broken or missing" and 1 EA under "Housing or support - broken or missing parts" for the defect "Physical Damage."

18.02 AIRFIELD LIGHTING

COMPONENTS

◆ 18.02.01 APPROACH LIGHTING

Approach lighting is a series of steady burning lights and in some cases flashing lights that assist aircraft when approaching the runway. They are located at the ends of the runway and are elevated bars with lights or individual fixtures mounted on support structures.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage:** (caused by impact damage, wear, and use)			
Observation:			
a. Housing or support - loose or misaligned parts. (Requires tightening or adjusting.) *** {Severity L}	EA		
b. Lens cracked, seal broken or missing. *** {Severity H}	EA		
c. Housing or support - broken or missing parts. *** {Severity H}	EA		

Defect:

*** Corrosion:** (caused by water damage, etc.)			
Observation:			
a. Deterioration evidenced by pitting, or blistering. *** {Severity M}	EA		
b. Deterioration evidenced by holes or loss of metal. *** {Severity H}	EA		

Defect:

*** Light Inoperable:**			
Observation:			
a. Light is not visible. *** {Severity H}	EA		1

18.02 AIRFIELD LIGHTING

COMPONENTS (Continued)

◆ 18.02.02 RUNWAY LIGHTING

Runway lights are either flush mounted lights in the pavement or elevated beyond the sides and ends of the runway. Flush mounted lights are located near the center line of the runway or in cases away from the center line in the touchdown zone. Elevated runway lights are either mounted on a stake driven into the ground or mounted on top of a can which is typical flush with grade. Elevated runway lights are typically white, red, green, or yellow, or a combination of these colors.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage:** (caused by impact damage, wear, and use)			
Observation:			
a. Housing or support - loose or misaligned parts. (Requires tightening or adjusting.) *** {Severity L}	EA		
b. Lens cracked, seal broken or missing. *** {Severity H}	EA		
c. Housing or support - broken or missing parts. *** {Severity H}	EA		

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:** (caused by water damage, etc.)			
Observation:			
a. Deterioration evidenced by pitting, or blistering. *** {Severity M}	EA		
b. Deterioration evidenced by holes or loss of metal. *** {Severity H}	EA		

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Light Inoperable:**			
Observation:			
a. Light is not visible. *** {Severity H}	EA		2

18.02 AIRFIELD LIGHTING

COMPONENTS (Continued)

◆ 18.02.03 TAXIWAY LIGHTING

Taxiway lights are either mounted flush in the pavement near the center line of the taxiway, or elevated beyond the edge of the taxiway. Elevated taxiway lights are either mounted on a stake driven into the ground, or mounted on top of a can which is typically flush with grade. Elevated taxiway lights are typically blue. Flush mounted taxiway lights are typically green, yellow, or red, or a combination of these colors. Flush mounted taxiway lights can be unidirectional, Bi-directional or Omnidirectional. Illuminated guidance signs are elevated above grade beyond the edge of the taxiway.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Physical Damage:** (caused by impact damage, wear, and use)			
Observation:			
a. Housing or support - loose or misaligned parts. (Requires tightening or adjusting.) *** {Severity L}	EA		
b. Lens cracked, seal broken or missing. *** {Severity H}	EA		
c. Housing or support - broken or missing parts. *** {Severity H}	EA		

Defect:

	UOM	LEVEL II KEY	LEVEL III KEY
* **Corrosion:** (caused by water damage, etc.)			
Observation:			
a. Deterioration evidenced by pitting, or blistering. *** {Severity M}	EA		
b. Deterioration evidenced by holes or loss of metal. *** {Severity H}	EA		

Defect:

	UOM	LEVEL II KEY	LEVEL III KEY
* **Light Inoperable:**			
Observation:			
a. Light is not visible. *** {Severity H}	EA		3

18.02 AIRFIELD LIGHTING

COMPONENTS (Continued)

◆ 18.02.04 APRON LIGHTING

Apron lights are flush mounted in the apron pavement and used to delineate parking areas for aircraft.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage:**			
(caused by impact damage, wear, and use)			
Observation:			
a. Housing or support - loose or misaligned parts. (Requires tightening or adjusting.)	EA		
*** {Severity L}			
b. Lens cracked, seal broken or missing.	EA		
*** {Severity H}			
c. Housing or support - broken or missing parts.	EA		
*** {Severity H}			

Defect:

*** Corrosion:**
(caused by water damage, etc.)
Observation:

	UOM	LEVEL II KEY	LEVEL III KEY
a. Deterioration evidenced by pitting, or blistering.	EA		
*** {Severity M}			
b. Deterioration evidenced by holes or loss of metal.	EA		
*** {Severity H}			

Defect:

*** Light Inoperable:**
Observation:

	UOM	LEVEL II KEY	LEVEL III KEY
a. Light is not visible.	EA		4
*** {Severity H}			

18.02 AIRFIELD LIGHTING

COMPONENTS (Continued)

◆ 18.02.05 MAST-TYPE APRON LIGHTING

Mast-type apron lights are pole-mounted fixtures used to provide illumination of the aircraft parking areas for security or maintenance of aircraft. Poles and foundation will be inspected as part of those components.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Physical Damage:** (caused by impact damage, wear, and use)			
Observation:			
a. Housing or support - loose or misaligned parts. (Requires tightening or adjusting.) *** {Severity L}	EA		
b. Bad ballast (noisy). *** {Severity M}	EA		
c. Lens cracked, seal broken or missing. *** {Severity H}	EA		
d. Housing or support - broken or missing parts. *** {Severity H}	EA		
e. Interior not moisture free. *** {Severity H}	EA		

Defect:

* **Corrosion:**
(caused by water damage, etc.)
Observation:

	UOM
a. Deterioration evidenced by pitting, or blistering. *** {Severity M}	SF
b. Deterioration evidenced by holes or loss of metal. *** {Severity H}	SF

Defect:

* **Light Inoperable:**
Observation:

	UOM	LEVEL II KEY	LEVEL III KEY
a. Light is not visible. *** {Severity H}	EA		5

18.02 AIRFIELD LIGHTING

COMPONENTS (Continued)

◆ 18.02.06 OBSTRUCTION LIGHTING

Obstruction Lighting is aeronautical ground lights provided to indicate obstruction. There are various types of obstruction lights such as steady-burning red obstruction lights, Class 1 low intensity, Class 2 high intensity, and high and low intensity flashing white or red obstruction lights.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage:**			
(caused by impact damage, wear, and use)			
Observation:			
a. Housing or support - loose or misaligned parts. (Requires tightening or adjusting.) *** {Severity L}	EA		
b. Nameplate - damaged or missing. *** {Severity L}	EA		
c. Lens cracked, seal broken or missing. *** {Severity H}	EA		
d. Housing or support - broken or missing parts. *** {Severity H}	EA		

Defect:

*** Corrosion:**
(caused by water damage, etc.)
Observation:

a. Deterioration evidenced by pitting, or blistering. *** {Severity M}	SF		
b. Deterioration evidenced by holes or loss of metal. *** {Severity H}	SF		

Defect:

*** Light Inoperable:**
Observation:

a. Light is not visible. *** {Severity H}	EA		6

18.02 AIRFIELD LIGHTING

COMPONENTS (Continued)

◆ 18.02.07 ENGINE-GENERATORS

This CAIS applies to fixed engine-generators. Engine-generators convert fuel into electrical power. Each unit consist of a engine and generator working together as a unit. Since the two pieces of equipment work together as a unit, the inspection will cover both mechanical and electrical components.

Engine-generators are used as primary or secondary power services and require the same inspection.

Control panel, circuit breaker, bonding and end use device connections will be inspected under separate components.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Records Not in Order:**			
Observation:			
a. Oil changes not on schedule.	EA		
*** {Severity L}			
b. Oil change record missing.	EA		
*** {Severity H}			
c. Oil analysis report incomplete or missing.	EA		
*** {Severity H}			

Defect:

	UOM		
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident).	SF		
*** {Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
*** {Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
*** {Severity H}			

18.02 AIRFIELD LIGHTING

COMPONENTS (Continued)

◆ 18.02.07 ENGINE-GENERATORS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Leaks:**			
Observation:			
a. Coolant on surface of equipment (possible coolant leaks). ***{Severity L}	EA		
b. Oil on surface of engine (possible oil leak). ***{Severity M}	EA		
c. Coolant under or around base of engine. ***{Severity H}	EA		
d. Oil puddle under or around base of engine. ***{Severity H}	EA		

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Regulations:**			
Observation:			
a. Speed regulation, plus/minus 1/2% to 1%. *** {Severity L}	EA		
b. Voltage regulation, plus/minus 1/2% to 1%. *** {Severity L}	EA		
c. Speed regulation, plus/minus 1% to 3%. *** {Severity M}	EA		
d. Voltage regulation, plus/minus 1% to 3%. *** {Severity M}	EA		
e. Speed regulation, plus/minus 3% or greater. *** {Severity H}	EA		7
f. Voltage regulation, plus/minus 3% or greater. *** {Severity H}	EA		8

18.02 AIRFIELD LIGHTING

COMPONENTS (Continued)

◆ 18.02.07 ENGINE-GENERATORS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Operating Temperature:**			
Observation:			
a. Engine 10°F or less above normal. *** {Severity M}	EA		
b. Engine greater than 10°F above normal. *** {Severity H}	EA		
c. Generator ventilating screens and air passages clogged. *** {Severity H}	EA		

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Radiator System:**			
Observation:			
a. Shutters stick open. *** {Severity L}	EA		
b. Radiator shroud damaged or loose. ***{Severity L}	EA		
c. Shutter screen dirty or clogged. *** {Severity M}	EA		
d. Radiator assembly damaged. ***{Severity M}	EA		
e. Shutters stick close. *** {Severity H}	EA		

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Improper Engine Operation:**			
Observation:			
a. Excessively noisy. *** {Severity M}	EA		9
b. Excessive vibration. ***{Severity M}	EA		9
c. Cylinder missing. *** {Severity M}	EA		

18.02 AIRFIELD LIGHTING

COMPONENTS (Continued)

◆ 18.02.07 ENGINE-GENERATORS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Belts and Hoses:**			
Observation:			
a. Hose end cracked.	EA		
***{Severity H}			
b. Belt cracked or torn.	EA		
***{Severity H}			
Defect:			
*** Exhaust System:**			
Observation:			
a. Rain cap missing.	EA		
***{Severity L}			
b. Heat shield missing.	EA		
***{Severity L}			
c. Muffler/pipe supports loose.	EA		
***{Severity M}			
d. Muffler/pipe supports broken or missing.	EA		
***{Severity M}			
e. Holes in muffler/exhaust pipe.	EA		
***{Severity H}			
Defect:			
*** Enclosure:**			
Observation:			
a. Enclosure damaged (cannot be sealed).	EA		
***{Severity M}			
b. Enclosure not grounded.	EA		
***{Severity H}			
Defect:			
*** Hot Spots:**			
Observation:			
a. Terminal 5° to 24°C above ambient.	EA	1	10
***{Severity M}			
b. Terminal 25°C or more above ambient.	EA	1	10
***{Severity H}			

18.02 AIRFIELD LIGHTING

REFERENCES

1. Aviation Lighting, Crouse-Hinds Navigation Aids, Cooper Industries, Inc., 1990

2. U.S. Department of Transportation, Federal Aviation Administration, Advisory Circulars:

   AC 150/5340-4C Installation Details for Runway Centerline Touchdown Zone Lighting Systems

   AC 150/5340-17B Standby Power for Non-FAA Airport Lighting Systems

   AC 150/5340-18A Taxiway Guidance Sign System

   AC 150/5340-19 Taxiway Centerline Lighting System

   AC 150/5340-21 Airport Miscellaneous Lighting Visual Aids

   AC 150/5340-24 Runway and Taxiway Edge Lighting System

   AC 150/5340-25 Visual Approach Slope Indicator (VASI) Systems

   AC 150/5340-26 Maintenance of Airport Visual Aid Facilities

   AC 150/5345-1L Approved Airport Lighting Equipment

   AC 150/5345-42B FAA Specification L-857, Airport Light Bases, Transformer Houses, and Junction Boxes

   AC 150/5345-44C Specification for Taxiway and Runway Signs

   AC 150/5345-46A Specification for Airport Lights

3. Caterpillar "Operation and Maintenance Manual"

4. Army TB 420-34, NAVFAC P_717.0, Air Force Manual 85-59 "Preventive/Recurring Maintenance Handbook"

18.02 AIRFIELD LIGHTING

LEVEL II KEY	GUIDE SHEET CONTROL NUMBER
1	GS-II 18.02.07-1

LEVEL III KEY	GUIDE SHEET CONTROL NUMBER
1	GS-III 18.02.01-1
2	GS-III 18.02.02-2
3	GS-III 18.02.03-3
4	GS-III 18.02.04-4
5	GS-III 18.02.05-5
6	GS-III 18.02.06-6
7	GS-III 18.02.07-7
8	GS-III 18.02.07-8
9	GS-III 18.02.07-9
10	GS-III 18.02.07-10

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 1

COMPONENT: ENGINE-GENERATORS
CONTROL NUMBER: GS-II 18.02.07-1

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully and to the degree required for scanning those devices being tested.

2. Make temperature measurements with an infrared scanner.

3. Measure the ambient temperature by measuring a spot on the inside of the enclosure that is least effected by any internal panel heat source.

4. Measure the temperature of the device specified.

5. Above-ambient temperature is calculated by subtracting the ambient temperature from the device temperature.

6. Record the results.

7. Close panels or doors carefully after the inspection is complete.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 1 (Continued)

COMPONENT: ENGINE-GENERATORS
CONTROL NUMBER: GS-II 18.02.07-1

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is made.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 1

COMPONENT: APPROACH LIGHTING
CONTROL NUMBER: GS-III 18.02.01-1

Application

This guide applies to the investigation of an inoperable light.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. With the lights operating, make a visual check to positively identify the lighting unit or units that are out.
2. De-energize the circuit and lock out the circuit or regulator so that the circuit cannot be energized from the remote lighting panel or other means before starting work on the lights. Install safety warning signs at appropriate location.
3. Remove old lamp and examine to determine if the lamp is at fault.
4. Inspect the lamp socket, the connections, and the wire insulation for signs of arcing or burning.
5. Check the light unit and base for evidence of leakage or condensation.
6. When all outages have been corrected, energize the circuit and make a visual check of the repaired units for proper operation. Record the repairs.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. U.S. Department of Transportation, Federal Aviation Administration Advisory Circular AC 150/5340-26 "Maintenance of Airport Visual Aid Facilities".

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 2

COMPONENT: RUNWAY LIGHTING
CONTROL NUMBER: GS-III 18.02.02-2

Application

This guide applies to the investigation of an inoperable light.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. With the lights operating, make a visual check to positively identify the lighting unit or units that are out.
2. De-energize the circuit and lock out the circuit or regulator so that the circuit cannot be energized from the remote lighting panel or other means before starting work on the lights. Install safety warning signs at appropriate location.
3. Remove old lamp and examine to determine if the lamp is at fault.
4. Inspect the lamp socket, the connections, and the wire insulation for signs of arcing or burning.
5. Check the light unit and base for evidence of leakage or condensation.
6. When all outages have been corrected, energize the circuit and make a visual check of the repaired units for proper operation. Record the repairs.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. U.S. Department of Transportation, Federal Aviation Administration Advisory Circular AC 150/5340-26 "Maintenance of Airport Visual Aid Facilities".

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 3

COMPONENT: TAXIWAY LIGHTING
CONTROL NUMBER: GS-III 18.02.03-3

Application

This guide applies to the investigation of an inoperable light.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. With the lights operating, make a visual check to positively identify the lighting unit or units that are out.
2. De-energize the circuit and lock out the circuit or regulator so that the circuit cannot be energized from the remote lighting panel or other means before starting work on the lights. Install safety warning signs at appropriate location.
3. Remove old lamp and examine to determine if the lamp is at fault.
4. Inspect the lamp socket, the connections, and the wire insulation for signs of arcing or burning.
5. Check the light unit and base for evidence of leakage or condensation.
6. When all outages have been corrected, energize the circuit and make a visual check of the repaired units for proper operation. Record the repairs.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. U.S. Department of Transportation, Federal Aviation Administration Advisory Circular AC 150/5340-26 "Maintenance of Airport Visual Aid Facilities".

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 4

COMPONENT: APRON LIGHTING
CONTROL NUMBER: GS-III 18.02.04-4

Application

This guide applies to the investigation of an inoperable light.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. With the lights operating, make a visual check to positively identify the lighting unit or units that are out.

2. De-energize the circuit and lock out the circuit or regulator so that the circuit cannot be energized from the remote lighting panel or other means before starting work on the lights. Install safety warning signs at appropriate location.

3. Remove old lamp and examine to determine if the lamp is at fault.

4. Inspect the lamp socket, the connections, and the wire insulation for signs of arcing or burning.

5. Check the light unit and base for evidence of leakage or condensation.

6. When all outages have been corrected, energize the circuit and make a visual check of the repaired units for proper operation. Record the repairs.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. U.S. Department of Transportation, Federal Aviation Administration Advisory Circular AC 150/5340-26 "Maintenance of Airport Visual Aid Facilities".

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 5

COMPONENT: MAST-TYPE APRON LIGHTING
CONTROL NUMBER: GS-III 18.02.05-5

Application

This guide applies to the investigation of an inoperable light.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. With the lights operating, make a visual check to positively identify the lighting unit or units that are out.

2. De-energize the circuit and lock out the circuit so that the circuit cannot be energized from the remote lighting panel or other means before starting work on the lights. Install safety warning signs at appropriate location.

3. Remove old lamp and examine to determine if the lamp is at fault.

4. Inspect the lamp socket, the connections, and the wire insulation for signs of arcing or burning.

5. Check the light unit and base for evidence of leakage or condensation.

6. When all outages have been corrected, energize the circuit and make a visual check of the repaired units for proper operation. Record the repairs.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. U.S. Department of Transportation, Federal Aviation Administration Advisory Circular AC 150/5340-26 "Maintenance of Airport Visual Aid Facilities".

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 6

COMPONENT: OBSTRUCTION LIGHTING
CONTROL NUMBER: GS-III 18.02.06-6

Application

This guide applies to the investigation of an inoperable light.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. With the lights operating, make a visual check to positively identify the lighting unit or units that are out.
2. De-energize the circuit and lock out the circuit so that the circuit cannot be energized from the remote lighting panel or other means before starting work on the lights. Install safety warning signs at appropriate location.
3. Remove old lamp and examine to determine if the lamp is at fault.
4. Inspect the lamp socket, the connections, and the wire insulation for signs of arcing or burning.
5. Check the light unit and base for evidence of leakage or condensation.
6. When all outages have been corrected, energize the circuit and make a visual check of the repaired units for proper operation. Record the repairs.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. U.S. Department of Transportation, Federal Aviation Administration Advisory Circular AC 150/5340-26 "Maintenance of Airport Visual Aid Facilities".

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 7

COMPONENT: ENGINE-GENERATORS
CONTROL NUMBER: GS-III 18.02.07-7

Application

This guide applies to the investigation of generator sets that have over and under speed symptoms.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level I inspection by observing the over-speed.

2. Refer to the manufacturer troubleshooting guide for testing and check-out procedures.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Refer to manufacturer troubleshooting guide for special tools required.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. Caterpillar *"Operation and Maintenance Manual"*

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 8

COMPONENT: ENGINE-GENERATORS
CONTROL NUMBER: GS-III 18.02.07-8

Application

This guide applies to the investigation of generator sets that have over and under voltage symptoms.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level I inspection by observing voltage meter on unit and by using independent voltage meter.
2. Inspect units voltage meter accuracy against independent voltage meter.
3. Inspect voltage regulator rheostat for proper adjustment settings or defects.
4. Inspect connections for high resistance using the infrared scanner inspection method.
5. Inspect bearings for defects or dryness.
6. Verify proper input voltage and/or frequency of incoming power when generator set is motor driven or engine governor on engine driven generator sets.
7. Verify generator set is not loaded above nameplate rating.
8. If none of the above is the problem, reference manufacturer troubleshooting guide for additional inspections or repairs to be made.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 8 (Continued)

COMPONENT: ENGINE-GENERATORS
CONTROL NUMBER: GS-III 18.02.07-8

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Digital Multimeter, Fluke #1TC67

2. Infrared Scanner, Raytek Inc., #PM2EM-L2

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. KATO Engineering, Instruction Manual for Brushless Revolving Field Alternating Current Generators

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 9

COMPONENT: ENGINE-GENERATORS
CONTROL NUMBER: GS-III 18.02.07-9

Application

This guide applies to the investigation of generator sets that have excessive noise or vibration symptoms.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level I inspection by using the vibration/sound level meter and measure the velocity (inches/second, peak), displacement (mils, peak-peak) and noise (db). Compare reading with acceptable manufacturer tolerances.

2. Inspect bearings for defects or dryness.

3. Inspect generator and prime mover for misalignment.

4. Inspect generator and prime mover for proper mounting.

5. Inspect generator and prime mover for transfer of vibration from another source.

6. If none of the above is the problem, reference manufacturer troubleshooting guide for additional inspections or repairs to be made.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Vibration/sound level meter, IRD Mechanalysis #1TC87

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. KATO Engineering, Instruction Manual for Brushless Revolving Field Alternating Current Generators

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 10

COMPONENT: ENGINE-GENERATORS
CONTROL NUMBER: GS-III 18.02.07-10

Application

This guide applies to the investigation of a hot terminal or device that is overheating from the flow of current through that terminal or device.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level II inspection by using the Infrared Scanner and measuring the temperatures of the device and terminals. If the device or terminals are not hot as indicated by the findings of Level II inspection, check the current flow through the device or terminals. Heat generated is proportionate to the square of the current. If there is little or no current flow through the device or terminal at the time of measurement, there will be no significant amount of heat generated.

2. For terminal connections, verify the type of conductor being terminated. If the conductor is an aluminum conductor, look for evidence of cold flow or melt down of conductor.

3. If there is evidence of cold flow or melt down of the aluminum conductor, the conductor should either be replaced or shortened and reconnected. When making new aluminum conductor terminations a joint compound should be used.

4. If the terminal is loose it should be tightened. De-energize prior to attempting tightening of terminal connections.

5. If none of the above is the problem than there is an internal problem and an on-site analysis must be made to determine if additional inspections are to be made or the unit is to be replaced.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 10 (Continued)

COMPONENT: ENGINE-GENERATORS
CONTROL NUMBER: GS-III 18.02.07-10

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared Scanner, Raytek, Inc., #PM2EM-L2

2. Torque wrench

3. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

18.03 AIRFIELD SPECIALTY SYSTEMS

DESCRIPTION

Airfield Specialty Systems are systems or structures which support airfield operations.

SPECIAL TOOL AND EQUIPMENT REQUIREMENTS

No special tools are needed for the inspection of the Specialty systems, beyond the requirements listed in the Airfield Systems Standard Tools Section.

SPECIAL SAFETY REQUIREMENTS

No special safety requirements are needed for the inspection of the Specialty systems, beyond the requirements listed in the Master Safety Plan and System Safety Section.

COMPONENT LIST

- 18.03.01 BLAST SHIELDS
- 18.03.02 TIE DOWNS/STATIC GROUNDING RECEPTACLES

RELATED SUBSYSTEMS

Due to the related nature of the elements requiring inspection, the following DS/IM's should be reviewed for concurrent inspection activities.

18.01 AIRFIELD PAVEMENT
18.02 AIRFIELD LIGHTING

STANDARD INSPECTION PROCEDURE

The standard inspection procedure for this subsystem is a visual inspection of each Specialty system, augmented by a LEVEL II Inspection when required. Very few LEVEL II or III inspection keys are indicated for the Airfield Specialty System. Some inspections may require the inspector to utilize a ladder or similar device to observe defect/observations above/below the inspectors normal line of sight. The inspection should be carried out in order of presentation of the various components. Associated defects and observations are listed which will be presented in the inspector's Data Collection Device (DCD).

The IU is defined at the component level. The unit of measure at the component level is square feet, (e.g., Blast Shield). Since the unit of measure is square feet, the IU is determined by the identification of location (e.g., Blast Shield Calibration Pad).

18.03 AIRFIELD SPECIALTY SYSTEMS

For Example: The inspector locates 10 SF of damaged blast shield. This quantity is recorded in the field CAIS for the component "Airfield Specialty - Blast Shields" located by the IU defined at the component level as "Blast Shields." As the inspection continues on the IU, the inspector finds another damaged 5 SF of damaged blast shield. The observation is edited from 10 SF to 15 SF, for the IU with a number of occurrences of two. The IU itself is the entire Blast Shield.

For the above example, an occurrence is defined as a defect (or observation) which is detected within the inspector's line of vision. If the inspector has multiple defects (or observations) in an occurrence within the same discrete component, the inspector will quantify the observation that is considered most severe and identify the remaining quantity under the less severe observation for the discrete component.

For Example: 10 SF of Blast Shield is damaged but within that 10 SF, 4 SF is corroded. The inspector will quantify 4 SF under the observation "Corrosion" and 6 SF under the observation "bent," for the defect "Physical Damage."

18.03 AIRFIELD SPECIALTY SYSTEMS

COMPONENTS

◆ 18.03.01 BLAST SHIELDS

A Blast Shield is a physical barrier which is positioned to deflect heat and aircraft exhaust gases in a controlled fashion. Blast Shields are constructed of metal or concrete.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage:** (caused by impact damage and jet blast use)			
Observation:			
a. Material bent, loose, cracked or spalled.	SF		
*** {Severity L}			
b. Material missing, broken.	SF		
*** {Severity H}			
c. Loose or missing fasteners.	EA		
*** {Severity H}			

Defect:

	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:** (Caused by exposure, surface blast, etc.)			
Observation:			
a. Deterioration evidenced by pitting or blistering.	SF		
*** {Severity M}			
b. Deterioration evidenced by holes or loss of metal.	SF		
*** {Severity H}			

18.03 AIRFIELD SPECIALTY SYSTEMS

COMPONENTS (Continued)

◆ 18.03.02 TIE DOWNS/STATIC GROUNDING RECEPTACLES

Tie down anchors are used to secure parked aircraft and also serve as electrodes for grounding connectors for aircraft. They are hooks that are secured to airfield pavement or screw type where flexible pavement is used. Anchors are 3/4" diameter rods with a 1 1/4" eye. Combination tie downs/static ground receptacles are installed flush with the paved surface and have an attachment bar integral to the casting. A cover plate is used to provide protection for the receptacle.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Physical Damage:** (caused by impact damage, wear, and use)			
Observation:			
a. Loose or bent. *** {Severity M}	EA		1
b. Broken or missing coverplate. *** {Severity L}	EA		

18.03 AIRFIELD SPECIALTY SYSTEMS

REFERENCES

1. MEANS "Concrete Repair and Maintenance", Peter H. Emmons, 1994
2. U.S. Department of Transportation, Federal Aviation Administration - Tie-Down Sense, dated April 7/12/83

18.03 AIRFIELD SPECIALTY SYSTEMS

LEVEL II KEY	GUIDE SHEET CONTROL NUMBER

N/A

LEVEL III KEY	GUIDE SHEET CONTROL NUMBER
1	GS-III 18.03.03-1
2*	GS-III 18.03.03-2

* Indicates guide sheets which are not directly referenced by a Key. These are "triggered" by information beyond the inspection process such as time, age or repeated service calls.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 1

COMPONENT: TIE-DOWN/STATIC GROUNDING RECEPTACLES
CONTROL NUMBER: GS-III 18.03.03-1

Application

This guide applies to the investigation of possible deterioration of tie-downs due to pavement deterioration or physical damage.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety section.

Inspection Actions

In addition to the Level I inspection method performed on the component, testing should be performed. This includes:

1. Conduct pull-out test on tie-down.
2. Load on tie-down shall be determined by type of aircraft and manufacturer's recommendation.

Special Tools and Equipment

The following is a list of special instruments required beyond those listed in the standard tool section.

1. Hydraulic jack with load gauges.

Recommended Inspection Frequency

1. A tie-down should be inspected whenever repairs to the pavement are required or indication that the tie down is loose.

References

1. U.S. Department of Transportation, Federal Aviation Administration - Tie-Down Sense, dated April 7/12/83.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 2*

COMPONENT: TIE DOWNS/STATIC GROUNDING RECEPTACLES
CONTROL NUMBER: GS-III 18.03.03-2*

Application

This guide applies to the investigation of possible deterioration of a static grounding system due to age, alteration or ground fault discharge to the system.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

In addition to the Level I inspection method performed on the components, testing should be performed. This includes:

1. Review inspection guides or forms for conducting inspections of the static grounding system. These guides should contain sufficient information to guide the inspector through the inspection process so that he or she may document all areas of importance relating the methods of installation, the type and condition of system components, test methods, and the proper recording of the test data obtained.

2. Checking the static grounding system to determine the adequacy of the ground involves inspection of connections that is supplemented by an impedance test to enable an evaluation of those parts of the system not accessible for inspection.

3. Perform tests to verify continuity of those parts of the system that are concealed and that are not available for visual inspection.

4. Conduct ground resistance tests of the ground termination system and its individual ground electrodes if adequate disconnecting means have been provided. These test results should be compared with previous, or original, results or current accepted values, or both, for the soil conditions involved. If it is found that the test values differ substantially from previous values obtained under the same test procedures, additional investigations should be made to determine the reason for the difference.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 2* (Continued)

COMPONENT: TIE DOWNS/STATIC GROUNDING RECEPTACLES
CONTROL NUMBER: GS-III 18.03.03-2*

Special Tools and Equipment

The following is a list of special instruments required beyond those listed in the Standard Tool Section.

1. Ground resistance tester, Biddle #250260

2. Digital multimeter, Fluke #1TC67

Recommended Inspection Frequency

1. A grounding system should be inspected whenever any alterations or repairs are made to a system as well as following any known ground fault discharge to the system.

2. Complete, in-depth inspections of a system should be completed every ten years. It is recommended that critical systems be inspected every four years.

References

1. NFPA 77 *"Recommended Practice on Static Electricity"* 1993 Edition

2. Army TM 5-811-3, Air Force AFM 88-9, Chapter 3 "Electrical Design Lightning and Static Electricity Protection"

18.04 AIRFIELD LIGHTING VAULT

DESCRIPTION

The airfield lighting vault is used to house the airfield lighting equipment such as constant current regulators, circuit selector switches, plug cutouts, etc., and lighting and small power to serve the airfield lighting vault.

SPECIAL TOOL AND EQUIPMENT REQUIREMENTS

No special tools are needed for the inspection of the Lighting systems, beyond the requirements listed in the Airfield Systems Standard Tools Section.

SPECIAL SAFETY REQUIREMENTS

No special safety requirements are needed for the inspection of the lighting systems, beyond the requirements listed in the Master Safety Plan and System Safety Section.

COMPONENT LIST

- 18.04.01 CONSTANT CURRENT REGULATORS
- 18.04.02 SERIES PLUG CUTOUTS
- 18.04.03 CIRCUIT SELECTOR SWITCHES
- 18.04.04 RADIO CONTROLLERS
- 18.04.05 CIRCUIT BREAKER (LOW VOLTAGE)
- 18.04.06 CIRCUIT BREAKER (MEDIUM VOLTAGE)
- 18.04.07 DISCONNECT SWITCHES (LOW VOLTAGE)
- 18.04.08 DISCONNECT SWITCHES (MEDIUM VOLTAGE)
- 18.04.09 TRANSFER SWITCHES
- 18.04.10 TRANSFORMERS
- 18.04.11 ENCLOSURES WITH BUS BARS
- 18.04.12 LIGHTING FIXTURES - FLUORESCENT
- 18.04.13 LIGHTING FIXTURES - INCANDESCENT
- 18.04.14 LIGHTING CONTROLLERS
- 18.04.15 BONDING
- 18.04.16 CABLE TRAYS
- 18.04.17 CONDUIT SYSTEMS
- 18.04.18 WIREWAYS

RELATED SUBSYSTEMS

Due to the related nature of the elements requiring inspection, the following DS/IM's should be reviewed for concurrent inspection activities.

18.02 AIRFIELD LIGHTING

18.04 AIRFIELD LIGHTING VAULT

STANDARD INSPECTION PROCEDURE

Components require a Level I inspection as part of the basic inspection process. An additional Level II inspection may be indicated or "triggered" by the Level I inspection and should be accomplished by the inspector at that time. Additional Level III inspections may be indicated or "triggered" by a Level I and II inspection and should be accomplished by inspectors qualified to do that type of inspection.

Inspection should be carried out in the order of presentation for the various components. Associated defects and observations, for each major component, are listed in the inspector's CAIS.

COMPONENTS

◆ 18.04.01 CONSTANT CURRENT REGULATORS

Constant current regulators (dry or liquid) provide constant current output for runway lighting circuits. The equipment can have a wide range or controls and monitoring options.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	SF		

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.01 CONSTANT CURRENT REGULATORS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage:**			
Observation:			
a. Panel fastener loose, broken or missing. ***{Severity L}	EA		
b. Switch or pushbutton damaged or inoperative. ***{Severity M}	EA		
c. Ventilation obstructed. ***{Severity M}	EA		
d. Mounting loose broken or missing. ***{Severity L}	EA		
e. Enclosure damaged (cannot be sealed). ***{Severity M}	EA		
f. Unused opening not covered. ***{Severity M}	EA		
g. Cover missing. ***{Severity M}	EA		
h. Unit not grounded. ***{Severity H}	EA	1	
i. Gauge or meter broken or missing. ***{Severity M}	EA		
j. Security lock missing or inoperative. ***{Severity H}	EA		

Defect:

*** Hot Spots:**			
Observation:			
a.Terminal connection 5° to 24°C above ambient. ***{Severity M}	EA	2	1
b. Terminal connection 25°C or more above ambient. ***{Severity H}	EA	2	1

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.01 CONSTANT CURRENT REGULATORS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Oil Leak:**			
Observation:			
a. Oil on surface of tank (possible oil leak). ***{Severity L}	EA		14
b. Oil puddle under or around base of tank. ***{Severity H}	EA		14

Defect:

*** Overload Condition:**			
Observation:			
a. Constant current regulator KVA rating exceeded. ***{Severity H}	EA	22	15
b. Voltage regulator on maximum tap setting. ***{Severity H}	EA	22	15
c. Power factor correction below 0.9. ***{Severity H}	EA	22	15

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.02 SERIES PLUG CUTOUTS

Series Plug Cutouts (SPC) are devices installed at the constant current regulator output through which the series circuit passes. They provide a disconnecting means for maintenance personnel working on the airfield circuits. The SPC also shorts the series loop and shorts the regulator secondary aiding in maintenance checks and troubleshooting.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident).	SF		
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
***{Severity H}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage:**			
Observation:			
a. Enclosure mounting loose, broken or missing.	EA		
***{Severity L}			
b. Enclosure damaged	EA		
***{Severity M}			
c. Handle bent or inoperable.	EA		
***{Severity M}			
d. Unused openings not covered.	EA		
***{Severity M}			
e. Carbon tracking due to flashovers.	EA	3	
***{Severity H}			
f. Discoloration of blades and contacts due to overheating.	EA	3	
***{Severity H}			

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.02 SERIES PLUG CUTOUTS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Hot Spots:**			
Observation:			
a. Terminal or blade end 5° to 24°C above ambient. ***{Severity M}	EA	4	2
b. Terminal or blade end 25°C or more above ambient. ***{Severity H}	EA	4	2

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.03 CIRCUIT SELECTOR SWITCHES

Circuit selector switches are connected to the output of a single constant current regulator and switches that output to one or more airfield lighting series circuits. The circuit selector switch can be remote or local control and provide circuit selection of 1 to 4 lighting loops.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	SF		

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage:**			
Observation:			
a. Enclosure mounting loose, broken or missing. ***{Severity L}	EA		
b. Enclosure damaged (cannot be sealed). ***{Severity M}	EA		
c. Unused openings not covered. ***{Severity M}	EA		
d. Security devices missing or inoperative. ***{Severity H}	EA		
e. Carbon tracking due to flashovers. ***{Severity H}	EA	4	
f. Discoloration of blades and contacts due to overheating. ***{Severity H}	EA	4	

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.03 CIRCUIT SELECTOR SWITCHES (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Hot Spots:**			
Observation:			
a. Terminal or blade end 5° to 24°C above ambient.	EA	5	3
***{Severity M}			
b. Terminal of blade end 25°C or more above ambient.	EA	5	3
***{Severity H}			

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.04 RADIO CONTROLLERS

Radio controllers permit the remote activation of the airport lighting system by the pilot. This is accomplished by keying the microphone in a particular sequence at a designated frequency. The controller activates the lighting system upon receiving a series of pulses of radio frequency energy which closes relays for different lighting intensities.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	SF		

Defect:

* **Physical Damage:**			
Observation:			
a. Enclosure mounting loose, broken or missing. ***{Severity L}	EA		
b. Switch, pushbutton or indicating light damaged or broken. ***{Severity M}	EA	6	
c. Enclosure damaged (cannot be sealed). ***{Severity M}	EA		
d. Unused opening not covered. ***{Severity M}	EA		
e. Transformer discolored or blistered due to overheating. ***{Severity M}	EA	6	
f. Antenna damaged or missing. ***{Severity H}	EA		

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.04 RADIO CONTROLLERS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Hot Spots:**			
Observation:			
a. Control transformer 5° to 24°C above ambient. ***{Severity M}	EA	7	4
b. Control transformer 25°C or more above ambient. ***{Severity H}	EA	7	4

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.05 CIRCUIT BREAKERS (LOW VOLTAGE)

Circuit breakers (low voltage) are devices used to disconnect loads rated 600 volts or less from its source. They contain built-in overcurrent and undervoltage devices to protect down stream conductors and equipment from overcurrent loads. These breakers can be operated automatically by built-in devices or by manually built-in toggle switches.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	SF		

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage:**			
Observation:			
a. Enclosure mounting loose, broken or missing. ***{Severity L}	EA		
b. Panel fastener loose, broken or missing. ***{Severity L}	EA		
c. Enclosure damaged (cannot be sealed). ***{Severity M}	EA		
d. Unused opening not covered. ***{Severity M}	EA		
e. Door handle bent or inoperative. ***{Severity H}	EA		
f. Circuit breaker broken or damaged. ***{Severity H}	EA	8	
g. Security devices missing or inoperative. ***{Severity H}	EA		

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.05 CIRCUIT BREAKERS (LOW VOLTAGE) (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Hot Spots:**			
Observation:			
a. Terminal or breaker body 5° to 24°C above ambient. ***{Severity M}	EA	9	5
b. Terminal or breaker body 25°C or more above ambient. ***{Severity H}	EA	9	5

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.06 CIRCUIT BREAKERS (MEDIUM VOLTAGE)

Circuit breakers (medium voltage) are devices used to disconnect loads rated from 601 volts to 35 kV. These type of beakers open and close a circuit when signaled from an outside source. These sources are current and voltage sensing devices such as relays and solid state devices with their associated potential and current transformers or by pushbuttons or selector switches that are manually operated.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		
c. Corrosion evidenced by holes or loss base metal. ***{Severity H}	SF		

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage:**			
Observation:			
a. Enclosure mounting loose, broken or missing. ***{Severity L}	EA		
b. Panel fastener loose, broken or missing. ***{Severity L}	EA		
c. Enclosure damaged (cannot be sealed). ***{Severity M}	EA		
d. Unused opening not covered. ***{Severity M}	EA		
e. Security devices missing or inoperative. ***{Severity H}	EA		
f. Door handle bent or inoperative. ***{Severity H}	EA		
g. Circuit breaker broken or damaged. ***{Severity H}	EA		

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.06 CIRCUIT BREAKERS (MEDIUM VOLTAGE) (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Oil Leak:**			
Observation:			
a. Oil on surface of tank (possible oil leak). ***{Severity M}	EA		19
b. Oil puddle under or around base of tank. ***{Severity H}	EA		19

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.07 DISCONNECT SWITCHES (LOW VOLTAGE)

Disconnect switches (low voltage) are devices used to disconnect loads rated 600 volts or less from its source. Two types of disconnect switches are fused or non-fused. Disconnect switches are normally manually operated but could be electrically operated.

A safety disconnect switch is designed to interrupt rated current at rated voltage with or without a fuse unit as an integral part of the switch. With a fuse unit the safety disconnect switch provides overload and short circuit protection.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	SF		

Defect:

*** Physical Damage:**			
Observation:			
a. Enclosure mounting loose, broken or missing. ***{Severity L}	EA		
b. Panel fastener loose, broken or missing. ***{Severity L}	EA		
c. Enclosure damaged (cannot be sealed). ***{Severity M}	EA		
d. Door handle bent or inoperative. ***{Severity M}	EA		
e. Unused openings not covered. ***{Severity M}	EA		
f. Security devices missing or inoperable. ***{Severity H}	EA		
g. Carbon tracking due to flashovers. ***{Severity H}	EA	10	
h. Discoloration of blades and contacts due to overheating. ***{Severity H}	EA	10	

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.07 DISCONNECT SWITCHES (LOW VOLTAGE) (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Hot Spots:**			
Observation:			
a. Terminal, blade end or fuse clip 5° to 24°C above ambient. ***{Severity M}	EA	11	6
b. Terminal, blade end or fuse clip 25°C or more above ambient. ***{Severity H}	EA	11	6

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.08 DISCONNECT SWITCHES (MEDIUM VOLTAGE)

Fused cut-outs for the purpose of this inspection are considered disconnect switches. Disconnect switches (medium voltage) are devices used to disconnect loads rated from 601 volts to 35 kV from its source.

No-load disconnect switches are to be operated only when the interconnecting conductor on either side or both sides of the disconnect switch has been opened up by another device. These switches are not designed to be opened under load.

Full-load disconnect switches are designed to break a full-load current. However, it is desirable to open these switches under no-load condition, except possibly in an emergency situation.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident).	SF		
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
***{Severity H}			

Defect:

*** Physical Damage:**			
Observation:			
a. Enclosure mounting loose, broken or missing.	EA		
***{Severity L}			
b. Panel fastener loose, broken or missing.	EA		
***{Severity L}			
c. Enclosure damaged (cannot be sealed).	EA		
***{Severity M}			
d. Unused opening not covered.	EA		
***{Severity M}			
e. Door handle bent or inoperative.	EA		
***{Severity H}			
f. Security device missing or inoperative.	EA		
***{Severity H}			

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.08 DISCONNECT SWITCHES (MEDIUM VOLTAGE) (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage (Continued):**			
g. Insulator damage.	EA		
***{Severity H}			
h. Carbon tracking due to flashovers.	EA		
***{Severity H}			
i. Discoloration of blades and contacts due to overheating.	EA		
***{Severity H}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Hot Spots:**			
a. Terminal or switch body 5 to 24°C above ambient.	EA	25	21
***{Severity M}			
b. Terminal or switch body 25°C or more above ambient.	EA	25	21
***{Severity H}			

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.09 TRANSFER SWITCHES

Transfer switch has two power inputs, each from a separate power source and a single output to feed a given load. The purpose of the switch is to provide a means of transferring the load from one power source to another without remaking manual connections.

Transfer switches can be manually operated or both manually and automatically operated.

Transfer switches may be mounted independently or in substations, switchboards or motor control centers.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident).	SF		
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
***{Severity H}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Physical Damage:**			
Observation:			
a. Enclosure mounting loose, broken or missing.	EA		
***{Severity L}			
b. Panel fastener loose, broken or missing.	EA		
***{Severity L}			
c. Pilot light damaged or inoperative.	EA		
***{Severity L}			
d. Interior not clean or moisture free.	EA	12	
***{Severity L}			
e. Enclosure damaged (cannot be sealed).	EA		
***{Severity M}			
f. Unused opening not covered.	EA		
***{Severity M}			

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.09 TRANSFER SWITCHES (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage (Continued):**			
g. Handle bent or inoperative. ***{Severity H}	EA		
h. Security device missing or inoperative. ***{Severity H}	EA		
i. Carbon tracking due to flashovers. ***{Severity H}	EA	12	
j. Discoloration of blades and contacts due to overheating. ***{Severity H}	EA	12	
k. Unit not grounded. ***{Severity H}	EA	12	

Defect:

*** Hot Spots:**			
Observation:			
a. Terminal 5° to 24°C above ambient. ***{Severity M}	EA	13	7
b. Terminal 25°C or more above ambient. ***{Severity H}	EA	13	7

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.10 TRANSFORMERS

Transformers are static electric devices consisting of a single winding or multiple coupled windings with or without a magnetic core. Power is transferred by electromagnetic induction from the input to the output circuit usually with changed values of voltages and currents.

Transformers have six types of functions: power transformers converts one voltage source to another voltage power source, isolation transformers shields the load side winding from the line side winding, reduced voltage starting transformers reduces the motor terminal voltage during the starting cycle, buck/boost transformers either raise or lower output voltage to accommodate the load, current transformers proportions a high current flow to a low current flow for instrumentation and control purpose and potential transformers proportions a high voltage potential to a low voltage potential for instrumentation and control purposes.

Transformers, other than current and potential transformers, smaller than 5 kVA single phase or 15 kVA multi phase, will not be inspected. All current and potential transformers will be inspected.

Surge (lightning) arresters, insulators, foundations, poles and conductors bare will be inspected under separate components.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		18
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	SF		18

Defect:

*** Physical Damage:**			
Observation:			
a. Enclosure mounting loose, broken or missing. ***{Severity L}	EA		
b. Panel fastener loose, broken or missing. ***{Severity L}	EA		
c. Enclosure damaged (cannot be sealed). ***{Severity M}	EA		
d. Air intake/exhaust ducts blocked. ***{Severity M}	EA		

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.10 TRANSFORMERS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage (continued):**			
e. Air filter dirty or missing. ***{Severity M}	EA		
f. Unused opening not covered. ***{Severity M}	EA		
g. Cooling fan guard/blade broken. or missing. ***{Severity H}	EA		
h. Unit not grounded. ***{Severity H}	EA	24	
i. Gauge or meter broken or missing. ***{Severity M}	EA		
j. Security lock missing or inoperative. ***{Severity H}	EA		

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Oil Leak:**			
Observation:			
a. Oil on surface of tank (possible oil leak). ***{Severity L}	EA		20
b. Oil puddle under or around base of tank. ***{Severity H}	EA		20

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Hot Spots:**			
Observation:			
a. Terminal 5° to 24°C above ambient. ***{Severity M}	EA	14	8
b. Terminal 25°C or more above ambient. ***{Severity H}	EA	14	8
c. Oil cooling fin blocked. ***{Severity H}	EA		16
d. Low oil level (less than 2" above fin). ***{Severity H}	EA		16

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS

◆ 18.04.11 ENCLOSURES WITH BUS BARS

Enclosures with bus bars, their connections and structural steel that make up the enclosure, for motor control centers, panelboards, switchboards, switchyard and substations, includes doors and panels that are not part of any equipment mounted in the enclosure. Doors and panels not included in the enclosure inspection are those for circuit breakers, disconnect switches, combination starters, etc. which would be inspected as part of those components.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	SF		

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage:**			
Observation:			
a. Panel fastener loose, broken or missing. ***{Severity L}	EA		
b. Excessive dust, dirt or moisture accumulation. ***{Severity L}	EA	15	
c. Enclosure mounting loose, broken or missing. ***{Severity M}	EA		
d. Enclosure damaged (cannot be sealed). ***{Severity M}	EA		
e. Unused openings not covered. ***{Severity M}	EA		
f. Vent openings blocked. ***{Severity M}	EA		
g. Air filter dirty or missing. ***{Severity M}	EA	15	
h. Unit not grounded. ***{Severity H}	EA	15	

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS

◆ **18.04.11 ENCLOSURES WITH BUS BARS (Continued)**

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Hot Spots:**			
Observation:			
a. Bus connection 5° to 24°C. above ambient	EA	16	9
***{Severity M}			
b. Bus connection 25°C or more above ambient.	EA	16	9
***{Severity H}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Electrical Power:**			
Observation:			
a. Voltage unbalance plus/minus 2 to 2.9%.	EA	23	
***{Severity L}			
b. Voltage from normal plus 4 to 5.9%/minus 3 to 4.9%.	EA	23	
***{Severity L}			
c. Voltage unbalanced plus/minus 3 to 4.9%.	EA	23	
***{Severity M}			
d. Voltage from normal plus 6 to 9.9%/minus 5 to 7.9%.	EA	23	
***{Severity M}			
e. Voltage unbalance plus/minus 5% or more.	EA	23	17
***{Severity H}			
f. Voltage from normal plus 10% or more/minus 8% or more.	EA	23	17
***{Severity H}			
g. Load current more than 2% above FLC.	EA	23	17
***{Severity H}			

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS

◆ 18.04.12 LIGHTING FIXTURES - FLUORESCENT

Lighting fixtures, also known as luminaries, are devices that transform electrical energy to energy in the visible spectrum.

Fluorescent lighting fixture assemblies consist of housing, ballasts, lamps, lens, reflectors, sockets and emergency battery packs.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident).	SF		
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	SF		
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
***{Severity H}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage:**			
Observation:			
a. Fixture lens door broken or missing.	EA		
***{Severity L}			
b. Dirty or discolored lens.	EA		
***{Severity L}			
c. Battery test switch broken or missing.	EA		
***{Severity L}			
d. Fixture not adequately secured.	EA		
***{Severity M}			
e. Lighting lens broken or missing.	EA		
***{Severity M}			
f. Socket broken or missing.	EA		
***{Severity M}			
g. Fixture inoperative.	EA	17	10
***{Severity M}			
h. Bad ballast (noisy).	EA		
***{Severity M}			

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.12 LIGHTING FIXTURES - FLUORESCENT (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Physical Damage (Continued):**			
i. Lamps missing. ***{Severity M}	EA		
j. Fixture housing damaged or missing. ***{Severity H}	EA		
k. Interior not moisture-free. ***{Severity H}	EA		

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.13 LIGHTING FIXTURES - INCANDESCENT

Lighting fixtures, also known as luminaries, are devices that transform electrical energy to energy in the visible spectrum.

Incandescent lighting fixture assemblies consist of housing, lamps, lens, reflectors, sockets and baffles. Exit and emergency battery units will be inspected under this component.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident).	SF		
***{Severity L}			
b. Corrosion evidenced by pitting. or blistering.	SF		
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	SF		
***{Severity H}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage:**			
Observation:			
a. Fixture lens door broken or missing.	EA		
***{Severity L}			
b. Dirty or discolored lens.	EA		
***{Severity L}			
c. Fixture not adequately secured.	EA		
***{Severity M}			
d. Lighting lens broken or missing.	EA		
***{Severity M}			
e. Safety guard/louver broken or missing.	EA		
***{Severity M}			
f. Reflector broken or missing.	EA		
***{Severity M}			
g. Socket broken or missing.	EA		
***{Severity M}			
h. Fixture inoperative.	EA	18	11
***{Severity M}			

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.13 LIGHTING FIXTURES - INCANDESCENT (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage (Continued):**			
i. Lamp missing. ***{Severity M}	EA		
j. Lighting baffle burned, broken or missing. ***{Severity M}	EA		
k. Fixture housing damaged or missing. ***{Severity H}	EA		
l. Interior not moisture-free. ***{Severity H}	EA		

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.14 LIGHTING CONTROLLERS

Lighting controllers turn the lighting fixtures on/off and in some instances control the brightness of the lights. Controllers consist of on/off switches, dimmers, conductors, motion/occupancy sensors, photocells and time clocks.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident). ***{Severity L}	SF		
b. Corrosion evidenced by pitting or blistering. ***{Severity M}	SF		
c. Corrosion evidenced by holes or loss of base metal. ***{Severity H}	SF		

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage:**			
Observation:			
a. Loose enclosure mounting. ***{Severity L}	EA		
b. Discolored switch. ***{Severity L}	EA		
c. Noisy dimmer. ***{Severity L}	EA		
d. Motion/occupancy sensor inoperative. ***{Severity L}	EA	19	12
e. Motion/occupancy sensor housing broken. ***{Severity L}	EA		
f. Photocell housing broken. ***{Severity L}	EA		
g. Time clock mechanism broken. ***{Severity L}	EA		
h. Enclosure damaged (cannot be sealed). ***{Severity M}	EA		
i. Unused opening not covered. ***{Severity M}	EA		

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.14 LIGHTING CONTROLLERS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage (Continued):**			
j. Switch cover plate broken or missing. ***{Severity H}	EA		
k. On/off switch handle broken. ***{Severity H}	EA		
l. Dimmer switch broken. ***{Severity H}	EA		

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.15 BONDING

Bonding provides an electrical connection between an electrically conductive object and a component of a lightning protection or grounding system that is intended to significantly reduce potential differences created by lightning currents. Bonding also provides electrical continuity and the capacity to conduct safely any imposed fault or static voltage induced currents.

Static electric charges and electric currents from lightning can cause stray currents to flow in tanks, tank trucks, pipeline, hose nozzles, raceways and other equipment. Such equipment must be properly bonded throughout each system and properly grounded in order to prevent such stray currents and charges from producing arcs (sparking) and causing serious personnel shocks, explosion hazards and fires.

Types of bonding methods are fusing weld, pressure connectors and clamps.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident).	EA		
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	EA		
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	EA		
***{Severity H}			

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Physical Damage:**			
Observation:			
a. Bond cracked or chipped.	EA		
***{Severity L}			
b. Improper bond material used.	EA		
***{Severity L}			
c. Bond melted or burnt.	EA		
***{Severity H}			
d. Loose connections.	EA		
***{Severity H}			
e. Bond missing.	EA		
***{Severity H}			

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.16 CABLE TRAYS

Cable tray is a unit or an assembly of units or sections and associated fittings, forming a rigid structural system used to support cables and other raceways.

Typical cable trays are of the ladder, trough, channel, or solid bottom type.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
*** Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident).	LF		
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	LF		
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	LF		
***{Severity H}			

Defect:

	UOM		
*** Physical Damage:**			
Observation:			
a. Unit bent or bowed.	LF		
***{Severity L}			
b. Fittings cracked.	EA		
***{Severity L}			
c. Supports loose or missing.	EA		
***{Severity L}			
d. Fitting loose or missing.	EA		
***{Severity L}			
e. Cover missing.	LF		
***{Severity L}			
f. Ventilation obstructed.	LF		
***{Severity L}			
g. Tray not grounded.	EA		
***{Severity H }			

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.17 CONDUIT SYSTEMS

Conduits are part of the electrical system that support and protect conductors. This system includes conduits, conduit bodies, pull boxes, junction boxes, outlet boxes and their supports.

Types of conduits commonly used are: Intermediate Metal Conduit, Rigid Metal Conduit, Rigid Nonmetallic Conduit, Electric Metallic Conduit, Flexible Metallic Tubing, Flexible Metal Conduit, Liquidtight Flexible Metal Conduit, Liquidtight Flexible Nonmetallic Conduit, Surface Metal Raceways, and Surface Nonmetallic Raceways. (Power Poles and Plugmold/wiremold are considered surface raceway.)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident).	LF		
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	LF		
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	LF		
***{Severity H}			

Defect:

* **Physical Damage:**			
Observation:			
a. Conduit bent.	LF		
***{Severity L}			
b. Conduit sagging.	LF		
***{Severity L}			
c. Conduit support loose or missing.	EA		
***{Severity L}			
d. Box gasketing missing.	EA	20	
***{Severity L}			
e. Box damage.	EA		
***{Severity L}			
f. Box cover fastener loose or missing.	EA		
***{Severity L}			

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.17 CONDUIT SYSTEMS (Continued)

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
g. Box support loose, broken or missing. ***{Severity L}	EA		
h. Plugmold/wiremold support loose or missing. ***{Severity L}	EA		
i. Unused opening not covered or plugged. ***{Severity M}	EA		
j. Cover plates missing. ***{Severity M}	EA		
k. Plugmold/wiremold damaged. ***{Severity M}	LF		
l. Conduit separation (wire exposed). ***{Severity H}	EA		
m. Conduit not bonded. ***{Severity H}	EA		

18.04 AIRFIELD LIGHTING VAULT

COMPONENTS (Continued)

◆ 18.04.18 WIREWAYS

Wireways are sheet-metal troughs with hinged or removable covers for housing and protecting electric wires and cables.

Defect:	UOM	LEVEL II KEY	LEVEL III KEY
* **Corrosion:**			
Observation:			
a. Surface corrosion (no pitting evident).	LF		
***{Severity L}			
b. Corrosion evidenced by pitting or blistering.	LF		
***{Severity M}			
c. Corrosion evidenced by holes or loss of base metal.	LF		
***{Severity H}			

Defect:

	UOM	LEVEL II KEY	LEVEL III KEY
* **Physical Damage:**			
Observation:			
a. Mounting loose, broken or missing.	EA		
***{Severity L}			
b. Fastener loose, broken or missing.	EA		
***{Severity L}			
c. Gasket missing or torn.	LF	21	
***{Severity L}			
d. Supports loose, broken or missing.	EA		
***{Severity L}			
e. Wireway damaged (cannot be sealed).	LF		
***{Severity M}			
f. Unused openings not covered	EA		
***{Severity M}			
g. End plate missing.	EA		
***{Severity M}			
h. Cover plate loose, broken or missing.	LF		
***{Severity M}			
i. Unit not grounded.	EA		
***{Severity H}			

18.04 AIRFIELD LIGHTING VAULT

REFERENCES

1. DOE CAS Manual, Volume 9: 0.09 Electrical

2. National Fire Protection Association (NFPA 70B) *"Recommended Practice for Electrical Equipment Maintenance"*, 1990 Edition

3. MEANS *"Facilities Maintenance & Repair Cost Data"*, 1994

4. *"Handbook of Building and Plant Maintenance Forms and Checklists"* by Roger W. Liska and Judith Morrison Liska

5. U. S. Department of Transportation, Federal Aviation Administration, Advisory Circulars:

   o AC 150/5340-26 Maintenance of Airport Visual Aid Facilities.
   o AC 150/53455-5A Circuit Selector Switch
   o AC 150/5345-10E Specification for Constant Current Regulators and Regulator Monitors
   o AC 150/5345-13A Specification for L-841 Auxiliary Relay Cabinet Assembly for Pilot Control of Airport Lighting Circuits.

6. Crouse - Hinds Airport Lighting Products.

18.04 AIRFIELD LIGHTING VAULT

LEVEL II KEY	GUIDE SHEET CONTROL NUMBER
1	GS-II 18.04.01-1
2	GS-II 18.04.01-2
3	GS-II 18.04.02-3
4	GS-II 18.04.02-4
5	GS-II 18.04.03-5
6	GS-II 18.04.04-6
7	GS-II 18.04.04-7
8	GS-II 18.04.05-8
9	GS-II 18.04.05-9
10	GS-II 18.04.07-10
11	GS-II 18.04.07-II
12	GS-II 18.04.09-12
13	GS-II 18.04.09-13
14	GS-II 18.04.10-14
15	GS-II 18.04.II-15
16	GS-II 18.04.II-16
17	GS-II 18.04.12-17
18	GS-II 18.04.13-18
19	GS-II 18.04.14-19
20	GS-II 18.04.17-20
21	GS-II 18.04.18-21
22	GS-II 18.04.01-22
23	GS-II 18.04.11-23
24	GS-II 18.04.10-24
25	GS-II 18.04.08-25

LEVEL III KEY	GUIDE SHEET CONTROL NUMBER
1	GS-III 18.04.01-1
2	GS-III 18.04.02-2
3	GS-III 18.04.03-3
4	GS-III 18.04.04-4
5	GS-III 18.04.05-5
6	GS-III 18.04.07-6
7	GS-III 18.04.09-7
8	GS-III 18.04.10-8
9	GS-III 18.04.11-9
10	GS-III 18.04.12-10
11	GS-III 18.04.13-11
12	GS-III 18.04.14-12
13*	GS-III 18.04.10-13
14	GS-III 18.04.01-14
15	GS-III 18.04.01-15
16	GS-III 18.04.10-16
17	GS-III 18.04.11-17

18.04 AIRFIELD LIGHTING VAULT

LEVEL III KEY	GUIDE SHEET CONTROL NUMBER (Continued)
18	GS-III 18.04.10-18
19	GS-III 18.04.06-19
20	GS-III 18.04.10-20
21	GS-III 18.04.08-21

* Indicates guide sheets which are not directly referenced by a Key. these are "triggered" by information beyond the inspection process such as time, age or repeated service calls.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 1

COMPONENT: CONSTANT CURRENT REGULATORS
CONTROL NUMBER: GS-II 18.04.01-1

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.

2. Visually inspect for those physical damaged defects that are listed and tagged Level II Key No. as indicated above.

3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 2

COMPONENT: CONSTANT CURRENT REGULATORS
CONTROL NUMBER: GS-II 18.04.01-2

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully and to the degree required for scanning those devices being tested.

2. Make temperature measurements with an infrared scanner.

3. Measure the ambient temperature by measuring a spot on the inside of the enclosure that is least effected by any internal panel heat source.

4. Measure the temperature of the device specified.

5. Above-ambient temperature is calculated by subtracting the ambient temperature from the device temperature.

6. Record the results.

7. Close panels or doors carefully after the inspection is complete.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 2 (Continued)

COMPONENT: CONSTANT CURRENT REGULATORS
CONTROL NUMBER: GS-II 18.04.01-2

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is made.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 3

COMPONENT: SERIES PLUG CUTOUTS
CONTROL NUMBER: GS-II 18.04.02-3

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.

2. Visually inspect for those physical damaged defects that are listed and tagged Level II Key No. as indicated above.

3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 4

COMPONENT: SERIES PLUG CUTOUTS
CONTROL NUMBER: GS-II 18.04.02-4

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully and to the degree required for scanning those devices being tested.

2. Make temperature measurements with an infrared scanner.

3. Measure the ambient temperature by measuring a spot on the inside of the enclosure that is least effected by any internal panel heat source.

4. Measure the temperature of the device specified.

5. Above-ambient temperature is calculated by subtracting the ambient temperature from the device temperature.

6. Record the results.

7. Close panels or doors carefully after the inspection is complete.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 4 (Continued)

COMPONENT: SERIES PLUG CUTOUTS
CONTROL NUMBER: GS-II 18.04.02-4

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is made.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 5

COMPONENT: CIRCUIT SELECTOR SWITCHES
CONTROL NUMBER: GS-II 18.04.03-5

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully and to the degree required for scanning those devices being tested.

2. Make temperature measurements with an infrared scanner.

3. Measure the ambient temperature by measuring a spot on the inside of the enclosure that is least effected by any internal panel heat source.

4. Measure the temperature of the device specified.

5. Above-ambient temperature is calculated by subtracting the ambient temperature from the device temperature.

6. Record the results.

7. Close panels or doors carefully after the inspection is complete.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 5 (Continued)

COMPONENT: CIRCUIT SELECTOR SWITCHES
CONTROL NUMBER: GS-II 18.04.03-5

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is made.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 6

COMPONENT: RADIO CONTROLLERS
CONTROL NUMBER: GS-II 18.04.04-6

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.

2. Visually inspect for those physical damaged defects that are listed and tagged Level II Key No. as indicated above.

3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 7

COMPONENT: RADIO CONTROLLERS
CONTROL NUMBER: GS-II 18.04.04-7

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully and to the degree required for scanning those devices being tested.

2. Make temperature measurements with an infrared scanner.

3. Measure the ambient temperature by measuring a spot on the inside of the enclosure that is least effected by any internal panel heat source.

4. Measure the temperature of the device specified.

5. Above-ambient temperature is calculated by subtracting the ambient temperature from the device temperature.

6. Record the results.

7. Close panels or doors carefully after the inspection is complete.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 7 (Continued)

COMPONENT: RADIO CONTROLLERS
CONTROL NUMBER: GS-II 18.04.04-7

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is made.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 8

COMPONENT: CIRCUIT BREAKERS (LOW VOLTAGE)
CONTROL NUMBER: GS-II 18.04.05-8

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.

2. Visually inspect for those physical damaged defects that are listed and tagged Level II Key No. as indicated above.

3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 9

COMPONENT: CIRCUIT BREAKERS (LOW VOLTAGE)
CONTROL NUMBER: GS-II 18.04.05-9

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.
2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.
3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully and to the degree required for scanning those devices being tested.
2. Make temperature measurements with an infrared scanner.
3. Measure the ambient temperature by measuring a spot on the inside of the enclosure that is least effected by any internal panel heat source.
4. Measure the temperature of the device specified.
5. Above-ambient temperature is calculated by subtracting the ambient temperature from the device temperature.
6. Record the results.
7. Close panels or doors carefully after the inspection is complete.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 9 (Continued)

COMPONENT: CIRCUIT BREAKERS (LOW VOLTAGE)
CONTROL NUMBER: GS-II 18.04.05-9

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is made.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 10

COMPONENT: DISCONNECT SWITCHES (LOW VOLTAGE)
CONTROL NUMBER: GS-II 18.04.07-10

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.

2. Visually inspect for those physical damaged defects that are listed and tagged Level II Key No. as indicated above.

3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 11

COMPONENT: DISCONNECT SWITCHES (LOW VOLTAGE)
CONTROL NUMBER: GS-II 18.04.07-11

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully and to the degree required for scanning those devices being tested.

2. Make temperature measurements with an infrared scanner.

3. Measure the ambient temperature by measuring a spot on the inside of the enclosure that is least effected by any internal panel heat source.

4. Measure the temperature of the device specified.

5. Above-ambient temperature is calculated by subtracting the ambient temperature from the device temperature.

6. Record the results.

7. Close panels or doors carefully after the inspection is complete.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 11 (Continued)

COMPONENT: DISCONNECT SWITCHES (LOW VOLTAGE)
CONTROL NUMBER: GS-II 18.04.07-11

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is made.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 12

COMPONENT: TRANSFER SWITCHES
CONTROL NUMBER: GS-II 18.04.09-12

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.

2. Visually inspect for those physical damaged defects that are listed and tagged Level II Key No. as indicated above.

3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 13

COMPONENT: TRANSFER SWITCHES
CONTROL NUMBER: GS-II 18.04.09-13

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully and to the degree required for scanning those devices being tested.

2. Make temperature measurements with an infrared scanner.

3. Measure the ambient temperature by measuring a spot on the inside of the enclosure that is least effected by any internal panel heat source.

4. Measure the temperature of the device specified.

5. Above-ambient temperature is calculated by subtracting the ambient temperature from the device temperature.

6. Record the results.

7. Close panels or doors carefully after the inspection is complete.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 13 (Continued)

COMPONENT: TRANSFER SWITCHES
CONTROL NUMBER: GS-II 18.04.09-13

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is made.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 14

COMPONENT: TRANSFORMERS
CONTROL NUMBER: GS-II 18.04.10-14

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully and to the degree required for scanning those devices being tested.

2. Make temperature measurements with an infrared scanner.

3. Measure the ambient temperature by measuring a spot on the inside of the enclosure that is least effected by any internal panel heat source.

4. Measure the temperature of the device specified.

5. Above-ambient temperature is calculated by subtracting the ambient temperature from the device temperature.

6. Record the results.

7. Close panels or doors carefully after the inspection is complete.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 14 (Continued)

COMPONENT: TRANSFORMERS
CONTROL NUMBER: GS-II 18.04.10-14

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is made.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 15

COMPONENT: ENCLOSURES WITH BUS BARS
CONTROL NUMBER: GS-II 18.04.11-15

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.

2. Visually inspect for those physical damaged defects that are listed and tagged Level II Key No. as indicated above.

3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 16

COMPONENT: ENCLOSURES WITH BUS BARS
CONTROL NUMBER: GS-II 18.04.11-16

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully and to the degree required for scanning those devices being tested.

2. Make temperature measurements with an infrared scanner.

3. Measure the ambient temperature by measuring a spot on the inside of the enclosure that is least effected by any internal panel heat source.

4. Measure the temperature of the device specified.

5. Above-ambient temperature is calculated by subtracting the ambient temperature from the device temperature.

6. Record the results.

7. Close panels or doors carefully after the inspection is complete.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 16 (Continued)

COMPONENT: ENCLOSURES WITH BUS BARS
CONTROL NUMBER: GS-II 18.04.11-16

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is made.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 17

COMPONENT: LIGHTING FIXTURES - FLUORESCENT
CONTROL NUMBER: GS-II 18.04.12-17

Application

This guide applies to lighting fixtures and motion/occupancy sensors that are inoperative.

Special Safety Requirements

No special safety requirements are needed for the performance of the Level II inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify if the branch circuit disconnecting means is in the "on" operation.

2. Verify if the light controller is in the "on" mode.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. *"Handbook of Building and Plant Maintenance Forms and Checklists"* by Roger W. Liska and Judith Morrison Liska

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 18

COMPONENT: LIGHTING FIXTURES - INCANDESCENT
CONTROL NUMBER: GS-II 18.04.13-18

Application

This guide applies to lighting fixtures and motion/occupancy sensors that are inoperative.

Special Safety Requirements

No special safety requirements are needed for the performance of the Level II inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify if the branch circuit disconnecting means is in the "on" operation.

2. Verify if the light controller is in the "on" mode.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. *"Handbook of Building and Plant Maintenance Forms and Checklists"* by Roger W. Liska and Judith Morrison Liska

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 19

COMPONENT: LIGHT CONTROLLERS
CONTROL NUMBER: GS-II 18.04.14-19

Application

This guide applies to lighting fixtures and motion/occupancy sensors that are inoperative.

Special Safety Requirements

No special safety requirements are needed for the performance of the Level II inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify if the branch circuit disconnecting means is in the "on" operation.

2. Verify if the light controller is in the "on" mode.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. *"Handbook of Building and Plant Maintenance Forms and Checklists"* by Roger W. Liska and Judith Morrison Liska

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 20

COMPONENT: CONDUIT SYSTEMS
CONTROL NUMBER: GS-II 18.04.17-20

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.

2. Visually inspect for those physical damaged defects that are listed and tagged Level II Key No. as indicated above.

3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 21

COMPONENT: WIREWAYS
CONTROL NUMBER: GS-II 18.04.18-21

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.

2. Visually inspect for those physical damaged defects that are listed and tagged Level II Key No. as indicated above.

3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 22

COMPONENT: CONSTANT CURRENT
CONTROL NUMBER: GS-II 18.04.01-22

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of up to 35 kV above ground.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully as required for doing the physical inspection.

2. Take power readings and inspect tap settings that are listed and tagged Level II Key No. as indicated above.

3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is performed on this piece of equipment.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 23

COMPONENT: ENCLOSURE WITH BUS BARS
CONTROL NUMBER: GS-II 18.04.11-23

Application

This guide applies to the investigation of voltage unbalances and overcurrent conditions in the inside of an enclosure, containing bare, energized, electrical parts, as applicable to the referenced component.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully as required for doing the physical inspection.

2. Using the multimeter, take voltage and current flow readings as listed in the standard and tagged for the Level II Key No. as indicated above.

3. A Level II Help Screen Chart will convert readings to percentages by observation.

4. Close panels or doors carefully after the inspection is completed.

5. If readings are out of limits, a Level III analysis is triggered.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is performed on this equipment.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

HELP SHEET - KEY NO. 23

COMPONENT: ENCLOSURE WITH BUS BARS
CONTROL NUMBER: GS-II 18.04.11-23

ELECTRICAL POWER
CONVERSION TABLE
READINGS PERCENTAGE

Voltage unbalance observations applies to 3 phase loads only. Measure voltage from phase to phase (3 measurements required). Use the difference between the 2 extreme readings.

Nominal Voltage

	208 V	240V	480V
2 to 2.9%	4.2 to 6.1 V	4.8 to 7.1 V	9.6 to 14.3 V
3 to 4.9%	6.2 to 10.3 V	7.2 to 11.9 V	14.4 to 23.9 V
5% or more	10.4 V or more	12.0 V or more	24.0 V or more

Voltage from normal - check 3 phase power only.

Nominal Voltage

	208 V	240 V	480 V
4 to 5.9% (+)	216.3 to 220.4	249.6 to 254.3	499.2 to 508.7
3 to 4.9% (-)	197.7 to 201.8	228.1 to 232.8	456.1 to 465.6
6 to 9.9% (+)	220.5 to 228.7	254.4 to 263.9	508.8 to 527.9
5 to 7.9% (-)	191.5 to 197.6	220.9 to 228.0	441.7 to 456.0
10.0% or more	228.8 or more	264.0 or more	528.0 or more
8.0% or less	191.4 or less	220.8 or less	441.6 or less

Load current - Use nameplate full load current for calculations. When the measured current exceeds the full load current, the % of overload is calculated as follows:

$$\% \text{ Overload} = \frac{(\text{Measured Current - Full Load Current}) \text{ Times } 100}{\text{Full Load Current}}$$

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 24

COMPONENT: TRANSFORMERS
CONTROL NUMBER: GS-II 18.04.10-24

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully as required for doing the visual inspection.

2. Visually inspect for those physical damaged defects that are listed and tagged Level II Key No. as indicated above.

3. Close panels or doors carefully after the inspection is completed.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection indicates one is required.

References

1. Sverdrup Corporation

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 25

COMPONENT: DISCONNECT SWITCHES (MEDIUM VOLTAGE)
CONTROL NUMBER: GS-II 18.04.08-25

Application

This guide applies to the investigation of the inside of an enclosure, containing bare, energized, electrical parts.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully and to the degree required for scanning those devices being tested.

2. Make temperature measurements with an infrared scanner.

3. Measure the ambient temperature by measuring a spot on the inside of the enclosure that is least effected by any internal panel heat source.

4. Measure the temperature of the device specified.

5. Above-ambient temperature is calculated by subtracting the ambient temperature from the device temperature.

6. Record the results.

7. Close panels or doors carefully after the inspection is complete.

LEVEL II INSPECTION METHOD GUIDE SHEET

LEVEL II GUIDE SHEET - KEY NO. 25 (Continued)

COMPONENT: DISCONNECT SWITCHES (MEDIUM VOLTAGE)
CONTROL NUMBER: GS-II 18.04.08-25

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is made.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 1

COMPONENT: CONSTANT CURRENT REGULATORS
CONTROL NUMBER: GS-III 18.04.01-1

Application

This guide applies to the investigation of a hot terminal or device that is overheating from the flow of current through that terminal or device.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level II inspection by using the Infrared Scanner and measuring the temperatures of the device and terminals. If the device or terminals are not hot as indicated by the findings of Level II inspection, check the current flow through the device or terminals. Heat generated is proportionate to the square of the current. If there is little or no current flow through the device or terminal at the time of measurement, there will be no significant amount of heat generated.

2. For terminal connections, verify the type of conductor being terminated. If the conductor is an aluminum conductor, look for evidence of cold flow or melt down of conductor.

3. If there is evidence of cold flow or melt down of the aluminum conductor, the conductor should either be replaced or shortened and reconnected. When making new aluminum conductor terminations a joint compound should be used.

4. If the terminal is loose it should be tightened. De-energize prior to attempting tightening of terminal connections.

5. If none of the above is the problem than there is an internal problem and an on-site analysis must be made to determine if additional inspections are to be made or the unit is to be replaced.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 1 (Continued)

COMPONENT: CONSTANT CURRENT REGULATORS
CONTROL NUMBER: GS-III 18.04.01-1

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared Scanner, Raytek, Inc., #PM2EM-L2

2. Torque wrench

3. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 2

COMPONENT: SERIES PLUG CUTOUTS
CONTROL NUMBER: GS-III 18.04.02-2

Application

This guide applies to the investigation of a hot terminal or device that is overheating from the flow of current through that terminal or device.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level II inspection by using the Infrared Scanner and measuring the temperatures of the device and terminals. If the device or terminals are not hot as indicated by the findings of Level II inspection, check the current flow through the device or terminals. Heat generated is proportionate to the square of the current. If there is little or no current flow through the device or terminal at the time of measurement, there will be no significant amount of heat generated.

2. For terminal connections, verify the type of conductor being terminated. If the conductor is an aluminum conductor, look for evidence of cold flow or melt down of conductor.

3. If there is evidence of cold flow or melt down of the aluminum conductor, the conductor should either be replaced or shortened and reconnected. When making new aluminum conductor terminations a joint compound should be used.

4. If the terminal is loose it should be tightened. De-energize prior to attempting tightening of terminal connections.

5. If none of the above is the problem than there is an internal problem and an on-site analysis must be made to determine if additional inspections are to be made or the unit is to be replaced.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 2 (Continued)

COMPONENT: SERIES PLUG CUTOUTS
CONTROL NUMBER: GS-III 18.04.02-2

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared Scanner, Raytek, Inc., #PM2EM-L2

2. Torque wrench

3. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 3

COMPONENT: CIRCUIT SELECTOR SWITCHES
CONTROL NUMBER: GS-III 18.04.03-3

Application

This guide applies to the investigation of a hot terminal or device that is overheating from the flow of current through that terminal or device.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level II inspection by using the Infrared Scanner and measuring the temperatures of the device and terminals. If the device or terminals are not hot as indicated by the findings of Level II inspection, check the current flow through the device or terminals. Heat generated is proportionate to the square of the current. If there is little or no current flow through the device or terminal at the time of measurement, there will be no significant amount of heat generated.

2. For terminal connections, verify the type of conductor being terminated. If the conductor is an aluminum conductor, look for evidence of cold flow or melt down of conductor.

3. If there is evidence of cold flow or melt down of the aluminum conductor, the conductor should either be replaced or shortened and reconnected. When making new aluminum conductor terminations a joint compound should be used.

4. If the terminal is loose it should be tightened. De-energize prior to attempting tightening of terminal connections.

5. If none of the above is the problem than there is an internal problem and an on-site analysis must be made to determine if additional inspections are to be made or the unit is to be replaced.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 3 (Continued)

COMPONENT: CIRCUIT SELECTOR SWITCHES
CONTROL NUMBER: GS-III 18.04.03-3

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared Scanner, Raytek, Inc., #PM2EM-L2

2. Torque wrench

3. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 4

COMPONENT: RADIO CONTROLLERS
CONTROL NUMBER: GS-III 18.04.04-4

Application

This guide applies to the investigation of a hot terminal or device that is overheating from the flow of current through that terminal or device.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level II inspection by using the Infrared Scanner and measuring the temperatures of the device and terminals. If the device or terminals are not hot as indicated by the findings of Level II inspection, check the current flow through the device or terminals. Heat generated is proportionate to the square of the current. If there is little or no current flow through the device or terminal at the time of measurement, there will be no significant amount of heat generated.

2. For terminal connections, verify the type of conductor being terminated. If the conductor is an aluminum conductor, look for evidence of cold flow or melt down of conductor.

3. If there is evidence of cold flow or melt down of the aluminum conductor, the conductor should either be replaced or shortened and reconnected. When making new aluminum conductor terminations a joint compound should be used.

4. If the terminal is loose it should be tightened. De-energize prior to attempting tightening of terminal connections.

5. If none of the above is the problem than there is an internal problem and an on-site analysis must be made to determine if additional inspections are to be made or the unit is to be replaced.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 4 (Continued)

COMPONENT: RADIO CONTROLLERS
CONTROL NUMBER: GS-III 18.04.04-4

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared Scanner, Raytek, Inc., #PM2EM-L2

2. Torque wrench

3. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 5

COMPONENT: CIRCUIT BREAKERS (LOW VOLTAGE)
CONTROL NUMBER: GS-III 18.04.05-5

Application

This guide applies to the investigation of a hot terminal or device that is overheating from the flow of current through that terminal or device.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level II inspection by using the Infrared Scanner and measuring the temperatures of the device and terminals. If the device or terminals are not hot as indicated by the findings of Level II inspection, check the current flow through the device or terminals. Heat generated is proportionate to the square of the current. If there is little or no current flow through the device or terminal at the time of measurement, there will be no significant amount of heat generated.

2. For terminal connections, verify the type of conductor being terminated. If the conductor is an aluminum conductor, look for evidence of cold flow or melt down of conductor.

3. If there is evidence of cold flow or melt down of the aluminum conductor, the conductor should either be replaced or shortened and reconnected. When making new aluminum conductor terminations a joint compound should be used.

4. If the terminal is loose it should be tightened. De-energize prior to attempting tightening of terminal connections.

5. If none of the above is the problem than there is an internal problem and an on-site analysis must be made to determine if additional inspections are to be made or the unit is to be replaced.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 5 (Continued)

COMPONENT: CIRCUIT BREAKERS (LOW VOLTAGE)
CONTROL NUMBER: GS-III 18.04.05-5

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared Scanner, Raytek, Inc., #PM2EM-L2

2. Torque wrench

3. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 6

COMPONENT: DISCONNECT SWITCHES (LOW VOLTAGE)
CONTROL NUMBER: GS-III 18.04.07-6

Application

This guide applies to the investigation of a hot terminal or device that is overheating from the flow of current through that terminal or device.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level II inspection by using the Infrared Scanner and measuring the temperatures of the device and terminals. If the device or terminals are not hot as indicated by the findings of Level II inspection, check the current flow through the device or terminals. Heat generated is proportionate to the square of the current. If there is little or no current flow through the device or terminal at the time of measurement, there will be no significant amount of heat generated.

2. For terminal connections, verify the type of conductor being terminated. If the conductor is an aluminum conductor, look for evidence of cold flow or melt down of conductor.

3. If there is evidence of cold flow or melt down of the aluminum conductor, the conductor should either be replaced or shortened and reconnected. When making new aluminum conductor terminations a joint compound should be used.

4. If the terminal is loose it should be tightened. De-energize prior to attempting tightening of terminal connections.

5. If none of the above is the problem than there is an internal problem and an on-site analysis must be made to determine if additional inspections are to be made or the unit is to be replaced.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 6 (Continued)

COMPONENT: DISCONNECT SWITCHES (LOW VOLTAGE)
CONTROL NUMBER: GS-III 18.04.07-6

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared Scanner, Raytek, Inc., #PM2EM-L2
2. Torque wrench
3. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*
2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 7

COMPONENT: TRANSFER SWITCHES
CONTROL NUMBER: GS-III 18.04.09-7

Application

This guide applies to the investigation of a hot terminal or device that is overheating from the flow of current through that terminal or device.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level II inspection by using the Infrared Scanner and measuring the temperatures of the device and terminals. If the device or terminals are not hot as indicated by the findings of Level II inspection, check the current flow through the device or terminals. Heat generated is proportionate to the square of the current. If there is little or no current flow through the device or terminal at the time of measurement, there will be no significant amount of heat generated.

2. For terminal connections, verify the type of conductor being terminated. If the conductor is an aluminum conductor, look for evidence of cold flow or melt down of conductor.

3. If there is evidence of cold flow or melt down of the aluminum conductor, the conductor should either be replaced or shortened and reconnected. When making new aluminum conductor terminations a joint compound should be used.

4. If the terminal is loose it should be tightened. De-energize prior to attempting tightening of terminal connections.

5. If none of the above is the problem than there is an internal problem and an on-site analysis must be made to determine if additional inspections are to be made or the unit is to be replaced.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 7 (Continued)

COMPONENT: TRANSFER SWITCHES
CONTROL NUMBER: GS-III 18.04.09-7

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared Scanner, Raytek, Inc., #PM2EM-L2

2. Torque wrench

3. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 8

COMPONENT: TRANSFORMERS
CONTROL NUMBER: GS-III 18.04.10-8

Application

This guide applies to the investigation of a hot terminal or device that is overheating from the flow of current through that terminal or device.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level II inspection by using the Infrared Scanner and measuring the temperatures of the device and terminals. If the device or terminals are not hot as indicated by the findings of Level II inspection, check the current flow through the device or terminals. Heat generated is proportionate to the square of the current. If there is little or no current flow through the device or terminal at the time of measurement, there will be no significant amount of heat generated.

2. For terminal connections, verify the type of conductor being terminated. If the conductor is an aluminum conductor, look for evidence of cold flow or melt down of conductor.

3. If there is evidence of cold flow or melt down of the aluminum conductor, the conductor should either be replaced or shortened and reconnected. When making new aluminum conductor terminations a joint compound should be used.

4. If the terminal is loose it should be tightened. De-energize prior to attempting tightening of terminal connections.

5. If none of the above is the problem than there is an internal problem and an on-site analysis must be made to determine if additional inspections are to be made or the unit is to be replaced.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 8 (Continued)

COMPONENT: TRANSFORMERS
CONTROL NUMBER: GS-III 18.04.10-8

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared Scanner, Raytek, Inc., #PM2EM-L2

2. Torque wrench

3. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 9

COMPONENT: ENCLOSURES WITH BUS BARS
CONTROL NUMBER: GS-III 18.04.11-9

Application

This guide applies to the investigation of a hot terminal or device that is overheating from the flow of current through that terminal or device.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level II inspection by using the Infrared Scanner and measuring the temperatures of the device and terminals. If the device or terminals are not hot as indicated by the findings of Level II inspection, check the current flow through the device or terminals. Heat generated is proportionate to the square of the current. If there is little or no current flow through the device or terminal at the time of measurement, there will be no significant amount of heat generated.

2. For terminal connections, verify the type of conductor being terminated. If the conductor is an aluminum conductor, look for evidence of cold flow or melt down of conductor.

3. If there is evidence of cold flow or melt down of the aluminum conductor, the conductor should either be replaced or shortened and reconnected. When making new aluminum conductor terminations a joint compound should be used.

4. If the terminal is loose it should be tightened. De-energize prior to attempting tightening of terminal connections.

5. If none of the above is the problem than there is an internal problem and an on-site analysis must be made to determine if additional inspections are to be made or the unit is to be replaced.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 9 (Continued)

COMPONENT: ENCLOSURES WITH BUS BARS
CONTROL NUMBER: GS-III 18.04.11-9

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared Scanner, Raytek, Inc., #PM2EM-L2
2. Torque wrench
3. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*
2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 10

COMPONENT: LIGHTING FIXTURES - FLUORESCENT
CONTROL NUMBER: GS-III 18.04.12-10

Application

This guide applies to lighting fixtures that are inoperative.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Determine if there is voltage at the fixture and at the lamp(s).
2. Replace the lamp(s) in the lighting fixture.
3. Replace the ballast in the lighting fixture.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Digital Multimeter, Fluke #1TC67
2. 6' Fiberglass Step Ladder

Recommended Inspection Frequency

Do a Level III inspection only when triggered by a Level II inspection.

References

1. *"Handbook of Building and Plant Maintenance, Forms and Checklists"* by Roger W. Liska and Judith Morrison Liska.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 11

COMPONENT: LIGHTING FIXTURES - INCANDESCENT
CONTROL NUMBER: GS-III 18.04.13-11

Application

This guide applies to lighting fixtures that are inoperative.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Determine if there is voltage at the fixture and at the lamp(s).
2. Replace the lamp(s) in the lighting fixture.
3. Replace the ballast in the lighting fixture.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Digital Multimeter, Fluke #1TC67
2. 6′ Fiberglass Step Ladder

Recommended Inspection Frequency

Do a Level III inspection only when triggered by a Level II inspection.

References

1. *"Handbook of Building and Plant Maintenance, Forms and Checklists"* by Roger W. Liska and Judith Morrison Liska.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 12

COMPONENT: LIGHT CONTROLLERS
CONTROL NUMBER: GS-III 18.04.14-12

Application

This guide applies to motion/occupancy sensors that are inoperative.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify that the manual switch is in the "on" position.
2. Activate the manual by-pass switch.
3. Determine if there is voltage at the motion/occupancy sensor.
4. Replace the motion/occupancy sensor.

Special Tools and Equipment

1. Digital multimeter, Fluke #1TC67
2. 6' fiberglass step ladder

Recommended Inspection Frequency

Do a Level III inspection only when triggered by a Level II inspection.

References

1. *"Handbook of Building and Plant Maintenance, Forms and Checklists"* by Roger W. Liska and Judith Morrison Liska.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 13*

COMPONENT: TRANSFORMER-112½ kVA or larger, dry or liquid
CONTROL NUMBER: GS-III 18.04.10-13

Application

This guide applies to the inspection of a transformer as a component. This inspection, while it is part of the Condition Assessment Survey, it is triggered by information beyond the inspection process such as time, age, or repeated service calls.

Special Safety Requirements

Inspectors need to have complete control of the transformer while performing the inspection. During a portion of the inspection the transformer will be taken out of service. Therefore the inspection of the transformer will be scheduled accordingly to accommodate the inspection requirements. No other safety requirements are required for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Locate the transformer's maintenance log or records and review this material concerning the following:
   a. Recorded readings of current, voltage, temperature, liquid level and gas pressure. Current, voltage and temperature level readings, should be taken at time of peak loads. Liquid level readings should be taken at time of low loads. Vacuum/pressure readings are to be taken at times of peak and low loads.
   b. Recorded data of when liquid sample were taken and copies of the sample test results.
   c. Recorded dates of previous inspections and maintenance pulled.

2. Specify corrective action for problem areas:
   a. If there is no maintenance log recording either any one or all of the following: current, voltage, temperature, liquid level and gas pressure, the maintenance procedure should be revised to include the collection of this data. These readings should be taken on a weekly basis.
   b. If the current readings indicate the transformer is consistently being overloaded, either some of the load should be transferred to another transformer if possible or the transformer should be upgraded to take the full load without overloading.
   c. If the voltage readings indicate the transformer output voltage is more than ±3% of the rated output voltage, the load tops should be adjusted accordingly and if this doesn't solve the problem then studies should be made to determine the cause and what corrective action should be taken.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 13* (Continued)

COMPONENT: TRANSFORMER-112½ kVA or larger, dry or liquid
CONTROL NUMBER: GS-III 18.04.10-13

d. If the temperature reading indicates the transformer temperature is above normal and the unit isn't overloaded, then either the cooling system isn't operating properly or the unit has an internal short. The first step is to clean all circulating air plates and exposed parts for good heat transfer. If this doesn't help, then do a complete testing on the winding, including resistance and tune ratio.

e. If the liquid level is low at no load, there may be a need to add liquid. The procedure to add liquid should be as specified by the manufacturer. Also if the liquid is low, a check should be made for leaks.

f. If the pressure gage readings are fairly constant or reads zero, the pressure gage is either broken or the tank has a leak. In either case tests should be performed to isolate the cause and correct the problem. A leaky tank may cause the liquid to become contaminated.

3. Provide additional inspection of the transformer as specified by the equipment manufacturer. If there is no such recommendation, then provide an inspection as outlined in NFPA 70B *"Recommended Practices for Electrical Equipment Maintenance"*, latest edition.

Special Tools and Equipment

The following is a list of special tools and equipment required beyond those listed in the Standard Tool Section.

1. Refer to manufacturer maintenance guide for special tools required
2. Infrared Scanner, Raytek Inc., CAT #PM2EM-L2
3. Torque wrench
4. Digital multimeter, Fluke #1TC67

Recommended Inspection Frequency

Follow manufacturers recommendations for frequency of inspection of the transformer for the first 3 years. If there is no manufacturer's recommendation than an annual inspection should be performed during this 3 year period. After the first 3 years of service, inspection frequency can be increased or decreased dictated by the past observations or experiences. When the number of service calls since the last inspection equals 2, the up-coming inspection should be performed immediately.

References

1. NFPA 70B, *"Recommended Practice for Electrical Equipment Maintenance"*, 1990 Edition

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 14

COMPONENT: CONSTANT CURRENT REGULATOR
CONTROL NUMBER: GS-III 18.04.01-14

Application

This guide applies to the investigation of oil leaks in the regulator tank that has signs of oil on surface of the tank or an oil puddle under or around base of tank.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level I inspection by finding the source of the oil. If the oil is coming from an external source no further inspection of the regulator is required. The external source should be identified and recommendations made to eliminate the contamination of the breaker.

2. If the oil source is coming from within the regulator, a determination should be made as how the oil is escaping.

3. If regulator repairs are made, oil analysis should be made after the repairs to determine if the oil is contaminated.

4. All contaminated oil should be removed and replaced with new oil.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Brush

2. Non-flammable cleaning fluid

3. Wiping material

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. Sverdrup Corporation

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 15

COMPONENT: CONSTANT CURRENT REGULATOR
CONTROL NUMBER: GS-III 18.04.01-15

Application

This guide applies to the investigation of power regulators that are overloaded.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level I inspection concerning overloading of the regulator.

2. For constant current regulator, determine if part of the load being supplied is no longer needed and should be shed, is it practical to transfer the load to another constant current regulator or if the constant current regulator needs to be replaced with a larger unit.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Voltmeter

2. Ampmeter

3. Power factor meter

4. Watthour meter

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. Sverdrup Corporation

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 16

COMPONENT: TRANSFORMER
CONTROL NUMBER: GS-III 18.04.10-16

Application

This guide applies to the investigation of 112.5 kVA transformers or larger that contain liquids used as electrical insulation and coolant.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level I inspection concerning cooling fin blockage or low liquid level.

2. Do a liquid analysis test.

3. If liquid analysis test results are okay, add liquid to proper level requirements.

4. If fin blockage remains, have liquid removed and clear the fin blockage.

5. If liquid analysis test results show contaminates, have the liquid removed, the contaminates flushed out and new liquid added.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared scanner

2. Tools and sampling containers for taking liquid samples and transferring these samples to the lab.

3. Tools and liquid supplies for adding the appropriate liquid to the transformer tank.

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. Sverdrup Corporation

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 17

COMPONENT: ENCLOSURE WITH BUS BARS
CONTROL NUMBER: GS-III 18.04.11-17

Application

This guide applies to the investigation of voltage unbalances and overcurrent conditions in the inside of an enclosure, containing bare, energized, electrical parts, as applicable to the referenced component.

Special Safety Requirements

The following list of special safety requirements, beyond the requirements listed in the Master Safety Plan and System Safety Section, are to be observed in the performance of this inspection.

1. This inspection guide applies to enclosures containing live electrical parts having a potential of 600 volts or less above ground. If the enclosure contains circuitry of higher potential, do not use this inspection guide.

2. Any enclosure that is padlocked for safety reason is not to be opened unless okayed by the person having control of the key.

3. Inspector needs to carefully open, inspect the inside and close the enclosure without shutting down the equipment, and without creating a hazard to himself.

Inspection Actions

1. Open panels or doors carefully as required for doing the physical inspection.

2. Using the multimeter, take voltage and current flow readings as listed in the standard and tagged for the Level II Key No. as indicated above.

3. A Level II Help Screen Chart will convert readings to percentages by observation.

4. Close panels or doors carefully after the inspection is completed.

5. If readings are out of limits, a Level III analysis is triggered.

Recommended Inspection Frequency

Do a Level II inspection each time a Level I inspection is performed on this equipment.

References

1. Sverdrup Corporation

LEVEL III INSPECTION METHOD GUIDE SHEET

HELP SHEET - KEY NO. 17

COMPONENT: ENCLOSURE WITH BUS BARS
CONTROL NUMBER: GS-III 18.04.11-17

ELECTRICAL POWER
CONVERSION TABLE
READINGS PERCENTAGE

Voltage unbalance observations applies to 3 phase loads only. Measure voltage from phase to phase (3 measurements required). Use the difference between the 2 extreme readings.

Nominal Voltage

	208 V	240V	480V
2 to 2.9%	4.2 to 6.1 V	4.8 to 7.1 V	9.6 to 14.3 V
3 to 4.9%	6.2 to 10.3 V	7.2 to 11.9 V	14.4 to 23.9 V
5% or more	10.4 V or more	12.0 V or more	24.0 V or more

Voltage from normal - check 3 phase power only.

Nominal Voltage

	208 V	240 V	480 V
4 to 5.9% (+)	216.3 to 220.4	249.6 to 254.3	499.2 to 508.7
3 to 4.9% (-)	197.7 to 201.8	228.1 to 232.8	456.1 to 465.6
6 to 9.9% (+)	220.5 to 228.7	254.4 to 263.9	508.8 to 527.9
5 to 7.9% (-)	191.5 to 197.6	220.9 to 228.0	441.7 to 456.0
10.0% or more	228.8 or more	264.0 or more	528.0 or more
8.0% or less	191.4 or less	220.8 or less	441.6 or less

Load current - Use nameplate full load current for calculations. When the measured current exceeds the full load current, the % of overload is calculated as follows:

$$\% \text{ Overload} = \frac{(\text{Measured Current - Full Load Current}) \text{ Times } 100}{\text{Full Load Current}}$$

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 18

COMPONENT: TRANSFORMER
CONTROL NUMBER: GS-III 18.04.10-18

Application

This guide applies to the investigation of 112.5 kVA transformers or larger that contain liquids used as electrical insulation and coolant.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level I inspection concerning the corrosive condition of the tank containing the coolant and insulation liquid.

2. If the tank has corroded to the point where contaminated air could possibly pass through the tank wall an oil analysis should be performed.

3. If the liquid is contaminated, provide test to determine how the tank leaks.

4. Analyze the test results to determine whether the transformer can be repaired or must be replaced.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Wire brush

2. Wrenches

3. Pressure gauge

4. Inert gas supply

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. Sverdrup Corporation

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 19

COMPONENT: CIRCUIT BREAKER (MEDIUM VOLTAGE)
CONTROL NUMBER: GS-III 18.04.06-19

Application

This guide applies to the investigation of oil leaks in the circuit breaker tank that has signs of oil on surface of the tank or an oil puddle under or around base of tank.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level I inspection by finding the source of the oil. If the oil is coming from an external source no further inspection of the breaker is required. The external source should be identified and recommendations made to eliminate the contamination of the breaker.

2. If the oil source is coming from within the breaker, a determination should be made as how the oil is escaping.

3. If breaker repairs are made, oil analysis should be made after the repairs to determine if the oil is contaminated.

4. All contaminated oil should be removed and replaced with new oil.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Brush

2. Non-flammable cleaning fluid

3. Wiping material

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. Sverdrup Corporation

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 20

COMPONENT: TRANSFORMER
CONTROL NUMBER: GS-III 18.04.06-20

Application

This guide applies to the investigation of oil leaks in the transformer tank that has signs of oil on surface of the tank or an oil puddle under or around base of tank.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level I inspection by finding the source of the oil. If the oil is coming from an external source no further inspection of the transformer is required. The external source should be identified and recommendations made to eliminate the contamination of the breaker.

2. If the oil source is coming from within the transformer, a determination should be made as how the oil is escaping.

3. If transformer repairs are made, oil analysis should be made after the repairs to determine if the oil is contaminated.

4. All contaminated oil should be removed and replaced with new oil.

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Brush

2. Non-flammable cleaning fluid

3. Wiping material

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level I inspection.

References

1. Sverdrup Corporation

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 21

COMPONENT: DISCONNECT SWITCHES (MEDIUM VOLTAGE)
CONTROL NUMBER: GS-III 18.04.08-21

Application

This guide applies to the investigation of a hot terminal or device that is overheating from the flow of current through that terminal or device.

Special Safety Requirements

No special safety requirements are needed for the performance of this Level III inspection beyond those required in the Master Safety Plan and System Safety Section.

Inspection Actions

1. Verify the findings of Level II inspection by using the Infrared Scanner and measuring the temperatures of the device and terminals. If the device or terminals are not hot as indicated by the findings of Level II inspection, check the current flow through the device or terminals. Heat generated is proportionate to the square of the current. If there is little or no current flow through the device or terminal at the time of measurement, there will be no significant amount of heat generated.

2. For terminal connections, verify the type of conductor being terminated. If the conductor is an aluminum conductor, look for evidence of cold flow or melt down of conductor.

3. If there is evidence of cold flow or melt down of the aluminum conductor, the conductor should either be replaced or shortened and reconnected. When making new aluminum conductor terminations a joint compound should be used.

4. If the terminal is loose it should be tightened. De-energize prior to attempting tightening of terminal connections.

5. If none of the above is the problem than there is an internal problem and an on-site analysis must be made to determine if additional inspections are to be made or the unit is to be replaced.

LEVEL III INSPECTION METHOD GUIDE SHEET

LEVEL III GUIDE SHEET - KEY NO. 21 (Continued)

COMPONENT: DISCONNECT SWITCHES (MEDIUM VOLTAGE)
CONTROL NUMBER: GS-III 18.04.08-21

Special Tools and Equipment

The following is a list of special tools required beyond those listed in the Standard Tool Section.

1. Infrared Scanner, Raytek, Inc., #PM2EM-L2

2. Torque wrench

3. Digital Multimeter, Fluke #1TC676

Recommended Inspection Frequency

Do a Level III inspection when triggered by a Level II inspection.

References

1. Maintenance Technology/September 1993; Write-up Title: *"Infrared Keeps All Systems Go"*

2. Raining - Agema Infrared Systems; *"Measurement of Excess Temperatures with Infrared Scanners"*

APPENDIX A

ABBREVIATIONS

APN	Apron
"D"	Durability
DETER	Deteriorated
DIA	Diameter
DIFF	Difference
DIV	Divided
EA	Each
EL	Elevation
ELEV	Elevation
FOD	Foreign Object Debris
HS-TW	High-Speed Taxiway
GS-II	Guide Sheet, LEVEL II Inspection Method
GS-III	Guide Sheet, LEVEL III Inspection Method
IN	Inches
LF	Linear Feet
LG. AMT.	Large Amount
MAT'LS	Materials
MED	Medium
PCS	Pieces
RW	Runway
SEV.	Severity
SF	Square Feet
SM. AMT.	Small Amount

APPENDIX A

SP.	Speed
TW	Taxiway
UOM	Unit of Measure
W/	With
'	Foot or Feet
"	Inch or Inches
>	Greater than
<	Less than

APPENDIX B

GLOSSARY

DESCRIPTION OF DISTRESS

Alligator or Fatigue Cracking Series of interconnecting cracks caused by fatigue failure of the asphalt concrete surface under repeated traffic loading. The cracking initiates at the bottom of the asphalt surface where tensile stress and strain is highest under a wheel load. The cracks propagate to the surface initially as one or more longitudinal parallel cracks. After repeated traffic loading, the cracks connect, forming many-sided, sharp-angled pieces that develop a pattern resembling chicken wire or the skin of an alligator. The pieces are usually less than one foot on the longest side. Alligator cracking occurs only in areas that are subjected to repeated traffic loadings. Therefore, it would not occur over an entire area unless the entire area was subjected to traffic loading. Alligator cracking does not occur in asphalt overlays over concrete slabs. Alligator cracking is considered a major structural distress.

Asphalt Bleeding A film of bituminous material on the pavement surface which creates a shiny, glass-like, reflecting surface that usually becomes quite sticky. Bleeding is caused by excessive amounts of asphalt cement in the mix and/or low air void contents. It occurs when asphalt fills the voids of the mix during hot weather and then expands out onto the surface of the pavement. Since the bleeding process is not reversible during cold weather, asphalt will accumulate on the surface.

Block Cracking Cracks divide the asphalt surface into approximately rectangular pieces. The blocks range is size from approximately 1 ft^2 to 100 ft^2. Cracking into larger blocks are generally rated as longitudinal and transverse cracking. Block cracking is caused mainly by shrinkage of the asphalt concrete and daily temperature cycling (which results in daily stress/strain cycling). It is not load-associated, although load can increase the severity of individual cracks from low to medium to high. The occurrence of block cracking usually indicates that the asphalt has hardened significantly. Block cracking normally occurs over a large proportion of pavement area, but sometimes will occur only in non-traffic areas.

Corrugation A form of plastic movement typified by ripples across the asphalt pavement surface. It occurs usually at points where traffic starts and stops. Corrugation usually occurs in asphalt layers that lack stability in warm weather, but may also be attributed to excessive moisture in a subgrade, contamination of the mix, or lack of aeration of liquid asphalt mixes.

APPENDIX B

Depression

This distress occurs only on pavements having an asphalt concrete surface over a jointed portland cement concrete (PCC) slab and they occur at transverse and longitudinal joints (i.e., widening joints). This distress does not include reflection cracking away from a joint or from any other type of base (i.e., cement stabilized, lime stabilized) as these cracks are identified as "Longitudinal and Transverse Cracking."

Reflection Cracking

Joint reflection cracking is caused mainly by movement of the PCC slab beneath the asphalt concrete (AC) surface because of thermal and moisture changes; it is generally not load-initiated. However, traffic loading may cause a breakdown of the AC near the initial crack, resulting in spalling. A knowledge of slab dimensions beneath the AC surface will help to identify these cracks.

Lane/Shoulder Drop-off or Heave

Difference in elevation between the traffic lane and the shoulder. Typically, the outside shoulder settles due to consolidation or a settlement of the underlying granular or subgrade material or pumping of the underlying material. Heave of the shoulder may occur due to frost action or swelling soils. Drop-off of granular or soil shoulder is generally caused from blowing away of shoulder material from passing trucks.

Lane/Shoulder Joint Separation

Widening of the joint between the traffic lane and the shoulder, generally due to movement in the shoulder. If the joint is tightly closed or well sealed so water cannot enter (or if there is no joint due to full-width paving), then lane/shoulder joint separation is not considered a distress. If the shoulder is not paved (i.e., gravel or grass), then the severity should be rated as high. If a curbing exists, then it should be rated according to the width of the joint between the asphalt surface and curb.

Longitudinal and Transverse Cracking

Cracks parallel to the pavement's centerline or laydown direction. They may be caused by (1) a poorly constructed paving lane joint, (2) shrinkage of the AC surface due to low temperatures or hardening of the asphalt, or (3) a reflective crack caused by cracks beneath the surface course, including cracks in PCC slabs (but not at PCC slab joints). Transverse cracks extend across the pavement centerline or direction of laydown. These may be caused by items (2) or (3) above. These types of cracks are not usually load-associated.

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Patch Deterioration	Deterioration of an area where the original pavement has been removed and replaced with either similar or different material.
Potholes	A bowl shaped hole of various sizes in the pavement surface. The surface has broken into small pieces by alligator cracking or by localized disintegration of the mixture and the material is removed by traffic. Traffic loads force the underlying materials out of the hole, increasing the depth.
Pumping and Water Bleeding	Ejection of water and fine materials under pressure through cracks under moving loads. As the water is ejected, it carries fine material resulting in progressive material deterioration and loss of support. Surface staining or accumulation of material on the surface close to cracks is evidence of pumping. Water bleeding occurs where water seeps slowly out of cracks in the pavement surface.
Raveling and Weathering	Wearing away of the pavement surface caused by the dislodging of aggregate particles (raveling) and loss of asphalt binder (weathering). They generally indicate that the asphalt binder has hardened significantly.
Rutting	A surface depression in the wheel paths. Pavement uplift may occur along the sides of the rut; however, in many instances, ruts are noticeable only after a rainfall, when the wheel paths are filled with water. Rutting stems from a permanent deformation in any of the pavement layers or subgrade, usually caused by consolidation or lateral movement of the materials due to traffic loads. Rutting may be caused by plastic movement in the mix in hot weather or inadequate compaction during construction. Significant rutting can lead to major structural failure of the pavement and hydroplaning potential. Wear of the surface in the wheel paths from studded tires can also cause a type of "rutting".
Slippage Cracking	Crescent or half-moon-shaped-cracks generally having two ends pointed into the direction of traffic. They are produced when braking or turning wheels cause the pavement surface to slide and deform. This usually occurs when there is a low-strength surface mix or poor bond between the surface and next layer of pavement structure.
Bumps and Sags	Bumps are small, localized, upward displacements of the pavement surface. they are different from shoves in that shoves are caused by unstable pavement. Bumps, on the other hand, can be caused by several factors, including: 1. Buckling or bulging of the surface of an asphalt concrete (AC) overlay over PCC pavement as a result of a blow-up in the PCC slab.

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2. Infiltration and buildup of material in a crack in combination with traffic loading (sometimes called tenting).

Sags are small, abrupt, downward displacements of the pavement surface. If bumps appear in a pattern perpendicular to traffic flow and are spaced at less than 10 feet, the distress is called corrugation.

Edge Cracking

Cracks parallel to and usually within one to two feet of the outer edge of the pavement. This distress is accelerated by traffic loading and can be caused by frost-weakened base or subgrade near the edge of the pavement. The area between the crack and pavement edge is classified as raveled if it breaks up (sometimes to the extent that pieces are removed).

Shoving

A permanent, longitudinal displacement of a localized area of the pavement surface caused by traffic loading. When traffic pushes against the pavement, it produces a short, abrupt wave in the pavement surface. This distress normally occurs only in unstable liquid asphalt mix (cutback or emulsion) pavements.

Shoves also occur where asphalt pavements abut PCC pavements; the PCC pavements increase in length and push the asphalt pavement, causing the shoving.

Blow-up

Most blow-ups occur during the spring and hot summer at a transverse joint or wide crack. Infiltration of incompressible materials into the joint or crack during cold periods results in high compressive stresses in hot periods. When this compressive pressure becomes too great, a localized upward movement of the slab or shattering occurs at the joint or crack. Blow-ups are accelerated due to a spalling away of the slab at the bottom creating reduced joint contact area. The presence of "D" cracking or freeze-thaw damage also weakens the concrete near the joint resulting in increased spalling and blow-up potential.

Corner Break

A crack that intersects the joints at a distance less than 6 feet on each side measured from the corner of the slab. A corner break extends vertically through the entire slab thickness. It should not be confused with a corner spall, which intersects the joint at an angle through the slab and is typically within 1 foot from the slab corner. Heavy repeated loads combined with pumping, poor load transfer across the joint, and thermal curling and moisture warping stresses result in corner breaks.

Depression

Localized settled areas. There is generally significant slab cracking in these areas due to uneven settlement. The

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depressions can be located by stains caused by oil droppings from vehicles and by riding over the pavement. Depressions can be caused by settlement or consolidation of the foundation soil or can be "built-in" during construction. They are frequently found near culverts. This is usually caused by poor compaction of soil around the culvert during construction. Depressions cause slab cracking, roughness and hydroplaning when filled with water of sufficient depth.

Durability Cracking

Also known as "D" cracking, is a series of closely spaced crescent-shaped hairline cracks that appear at a PCC pavement slab surface adjacent and roughly parallel to transverse and longitudinal joints, transverse and longitudinal cracks, and the free edges of pavement slab. The fine surface cracks often curve around the intersection of longitudinal joints/cracks and transverse joints/cracks. These surface cracks often contain calcium hydroxide residue which causes a dark coloring of the crack and immediate surrounding area. This may eventually lead to disintegration of the concrete within 1 to 2 feet or more of the joint or crack, particularly in the wheelpaths. "D" cracking is caused by freeze-thaw expansive pressures of certain types of coarse aggregates and typically begins at the bottom of the slab which disintegrates first.

Faulting of Transverse Joints and Cracks

A difference of elevation across a joint or crack. Faulting is caused in part by a buildup of loose materials under the approach slab near the joint or crack as well as depression of the leave slab. The buildup of eroded or infiltrated materials is caused by pumping from under the leave slab and shoulder (free moisture under pressure) due to heavy loadings. The warp and/or curl upward of the slab near the joint or crack due to moisture and/or temperature gradient contributes to the pumping condition. Lack of load transfer contributes greatly to faulting.

Joint Load Transfer System Associated Deterioration

Develops as a transverse crack a short distance (e.g., 9 inches) from a transverse joint at the end of joint dowels. This usually occurs when the dowel system fails to function properly due to extensive corrosion or misalignment. It may also be caused by a combination of small diameter dowels and heavy traffic loadings.

Joint Seal Damage of Transverse Joints

A damage occurs when incompressible materials and/or water can infiltrate into the joints. This infiltration can result in pumping, spalling and blow-ups. A joint sealant bonded to the edges of the slabs protects the joints from accumulation of incompressible materials and also reduces the amount of water

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seeping into the pavement structure. Typical types of joint seal damage are: (1) stripping of joint sealant, (2) extrusion of joint sealant, (3) weed growth, (4) hardening of the filler (oxidation), (5) loss of bond to the slab edges, and (6) lack or absence of sealant in the joint.

Lane Shoulder Drop-off or Heave

Occurs wherever there is a difference in elevation between the traffic lane and the shoulder. Typically, the outside shoulder settles due to consolidation or a settlement of the underlying granular or subgrade material or pumping of the underlying material. Heave of the shoulder may occur due to frost action or swelling soils. Drop-off of granular or earth shoulder is generally caused from blowing away of shoulder material from passing trucks.

Lane Shoulder Joint Separation

The widening of the joint between the traffic lane and the shoulder, generally due to movement in the shoulder. If the joint is tightly closed or well sealed so that water cannot easily infiltrate, then lane/shoulder joint separation is not considered a distress.

Longitudinal Cracks

Cracks occur generally parallel to the centerline of the pavement. They are often caused by improper construction of longitudinal joints or by a combination of heavy load repetition, loss of foundation support, and thermal and moisture gradient stresses.

Longitudinal Joint Faulting

Difference in elevation of two traffic lanes measured at the longitudinal joint. It is caused primarily by heavy truck traffic and settlement of the foundation.

Patch Deterioration (Including Replaced Slabs)

A patch is an area where a portion or all of the original slab has been removed and replaced with a permanent type of material (e.g., concrete or hot-mixed asphalt). Only permanent patches are included.

Popouts

A small piece of concrete that breaks loose from the surface due to freeze-thaw action, expansive aggregates, and/or nondurable materials. Popouts may be indicative of unsound aggregates and "D" cracking. Popouts typically range from approximately 1 inch to 4 inches in diameter and from ½ inch to 2 inches deep.

Pumping

Movement of material by water pressure beneath the slab when it is deflected under a heavy moving wheel load. Sometimes the pumped material moves around beneath the slab, but often it is ejected through joints and/or cracks (particularly along the

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longitudinal lane/shoulder joint with an asphalt shoulder). Beneath the slab there is typically particle movement counter to the direction of traffic across a joint or crack that results in a buildup of loose materials under the approach slab near the joint or crack. Many times some fine materials (silt, clay, sand) are pumped out, leaving a thin layer of relatively loose clean sand and gravel beneath the slab, along with voids causing loss of support. Pumping occurs even in pavement sections containing stabilized subbases.

Water Bleeding

Water seeps out of joints and/or cracks. Many times it drains out over the shoulder in low areas.

Scaling

Deterioration of the upper ⅛ to ½ inch of the concrete slab surface.

Map Cracking or Crazing

A series of fine cracks that extend only into the upper surface of the slab surface. Map cracking or crazing is usually caused by over-finishing of the slab and may lead to scaling of the surface. Scaling can also be caused by reinforcing steel being too close to the surface.

Spalling (Transverse and Longitudinal Joint/Crack)

Spalling of cracks and joints is the cracking, breaking, or chipping (or fraying) of the slab edges within 2 feet of the joint/crack. A spall usually does not extend vertically through the whole slab thickness but extends to intersect the joint at an angle. Spalling usually results from (1) excessive stresses at the joint or crack caused by infiltration of incompressible materials and subsequent expansion, (2) disintegration of the concrete from freeze-thaw action of "D" cracking, (3) weak concrete at the joint (caused by honey-combing, (4) poorly designed or constructed load transfer device (misalignment, corrosion), and/or (5) heavy repeated traffic loads.

Spalling (corner)

Raveling or breakdown of the slab within approximately 1 feet of the corner. However, corner spalls with both edges less than 3 inches long will not be recorded. A corner spall differs from a corner break in that the spall usually angles downward at about 45 degree to intersect the joint, while a break extends vertically through the slab. Corner spalling can be caused by freeze-thaw deterioration, "D" cracking, and other factors.

Swelling

An upward bulge of the asphalt pavement's surface, or movement or heave of the slab surface resulting in a sometimes sharp wave over a small area or a longer, gradual wave. The swell is usually accompanied by slab cracking. It is usually caused by frost heave in the subgrade or by an expansive soil. Swells can often be identified by oil droppings on the surface as well as riding over the pavement in a vehicle.

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Transverse and Diagonal Cracks	Linear cracks are caused by one or a combination of the following: heavy load repetition, thermal and moisture gradient stresses, and drying shrinkage stresses. Medium- or high-severity cracks are working cracks and are considered major structural distresses. They may sometimes be due to deep-seated differential settlement problems.
Divided Slab/Shattered Slab	Slab is divided by cracks into four or more pieces due to overloading and/or inadequate support. If all pieces or cracks are contained within a corner break, the distress is categorized as a severe corner break.
Polished Aggregate	It is caused by repeated traffic applications. When the aggregate in the surface becomes smooth to the touch, adhesion with vehicle tires is considerably reduced. When the portion of aggregate extending above the surface is small, the pavement texture does not significantly contribute to reducing vehicle speed. Polished aggregate should be counted when close examination reveals that the aggregate extending above concrete is negligible, and the surface aggregate is smooth to the touch. This type of distress is indicated when the number on a skid resistance test is low or has dropped significantly from previous ratings.
Punchout	A localized area of the slab that is broken into pieces. The punchout can take many different shapes and forms, but it is usually defined by a crack and a joint, or two closely spaced cracks (usually 5 feet wide). This distress is caused by heavy repeated loads, inadequate slab thickness, loss of foundation support, and/or a localized concrete construction deficiency (e.g., honey combing).
Shrinkage Cracking	Hairline cracks that are usually only a few feet long and do not extend across the entire slab. They are formed during the setting and curing of the concrete and usually do not extend through the depth of the slab.

APPENDIX C

LIFE CYCLES

18 AIRFIELD

18.01 AIRFIELD PAVEMENT

Asphalt surfaced pavement	20 YRS
Concrete surfaced pavement	20 YRS

Source:
AASHTO Guide for Design of Pavement Structures, 1986

18.02 AIRFIELD LIGHTING

Lighting Fixtures	20 YRS

Source:
Means Facilities Maintenance & Repair Cost Data, 1994

18.03 AIRFIELD SPECIALTY SYSTEMS

Blast Shields	25 YRS*
Tie Downs/Static Grounding Receptacles	50 YRS

*Assumed Life Cycle

Source:
Means Facilities Maintenance & Repair Cost Data, 1994

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LIFE CYCLES (Continued)

18.04 AIRFIELD LIGHTING VAULT

Engine-Generators	25 YRS
Constant Current Regulators	18 YRS
Series Plug Cutouts	25 YRS
Circuit Selector Switches	18 YRS
Radio Controllers	15 YRS
Circuit Breakers (Low Voltage)	50 YRS
Circuit Breakers (Medium Voltage)	50 YRS
Disconnect Switches (Low Voltage)	25 YRS
Disconnect Switches (Medium Voltage)	25 YRS
Transfer Switches	18 YRS
Transformers	30 YRS
Enclosures with Bus Bars	20 YRS
Lighting Fixtures - Fluorescent	20 YRS
Lighting Fixtures - Incandescent	20 YRS
Lighting Controllers	15 YRS
Bonding	50 YRS
Cable Trays	20 YRS
Conduit Systems	50 YRS
Wireways	20 YRS

Source:
Means Facilities Maintenance & Repair Cost Data, 1994